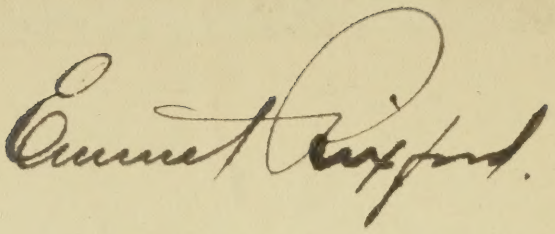
SOCIETAS · CHIRURGICA · AMERICANA
INSTIT · A · D · MDCCCLXXX



TRANSACTIONS

OF THE

AMERICAN

SURGICAL ASSOCIATION.

VOLUME THE TWENTIETH.

EDITED BY

RICHARD H. HARTE, M.D.,

RECORDER OF THE ASSOCIATION.

398651
8.12.41

PRINTED FOR THE ASSOCIATION.

FOR SALE BY

WILLIAM J. DORNAN, PHILADELPHIA.

1902.

Copyright, 1902, by RICHARD H. HARTE, M.D., Recorder of the Association.

RD
1
A48
v.20

DORNAN, PRINTER,
701-709 ARCH STREET,
PHILADELPHIA.

CONTENTS.

PAGE

Officers of the Association ix
List of Presidents of the Association xi
Fellows of the Association xiii
Honorary Fellows xxvii

Address of the President. By De Forest Willard, M.D. . 1
A Case of Perforating Gunshot Wound of the Stomach and Liver, with Posterior Through Drainage, and Recovery. By Roswell Park, M.D. 10
The Great Importance of Drainage in Bullet Wounds of Intra-peritoneal Viscera. By L. M. Tiffany, M.D. . . . 13
The Results of Wounds of the Large Joints by Modern Military Projectiles. By C. B. Nancrede, M.D. 18
A Case of Severed Spinal Cord in which Myelorrhaphy was Followed by Partial Return of Function. By Richard H. Harte, M.D., and Francis T. Stewart, M.D. . . 28
Removal of the Bladder and Prostate for Carcinoma through a Suprapubic Opening. By M. L. Harris, M.D. . . 54
Anatomical and Technical Reasons Why the Perineal is Preferable to the Suprapubic Route in Prostatic Surgery. By James E. Moore, M.D. 59
Permanent Suprapubic Drainage for Advanced Tuberculosis of the Bladder. Report of a Case at End of Five Years. By Charles A. Powers, M.D. 67
The Teaching of Surgery. By Herbert L. Burrell, M.D. . 86
The Teaching of Surgery, with Special Reference to the Didactic Method. By Joseph D. Bryant, M.D. 104

PAGE

I. The Essentials of Modern Hospital Construction. By Albert Vander Veer, M.D. 130
II. Pavilion F. By J. M. Mosher, M.D. 138
III. The Method Employed in Examining and Recording Pathological Material. By George Blumer, M.D. . . . 142
IV. Aseptic Technique in the Albany Hospital. By C. H. Richardson, M.D. 143
V. Remarks on the Method of Keeping Histories of Surgical Patients in the Albany Hospital. By Arthur W. Elting, M.D. 148
Complications Following Gastro-enterostomy. By William J. Mayo, M.D. 151
A New Method of Pyloroplasty. By J. M. T. Finney, M.D. . 165
The Surgical Treatment of Tuberculous Peritonitis. By A. J. Ochsner, M.D. 191
On a Case of Splenectomy for Leukæmic Enlargement. By Theodore A. McGraw, M.D. 210
A Case of Acute Suppurative Pancreatitis. By Francis W. Murray, M.D. 219
Carcinoma Limited to the Appendix Vermiformis; Discussion of Its Origin and Its Relation to Appendicitis. By Richard H. Harte, M.D., and Robert N. Willson, M.D. . . 228
Abdominal Hysterectomy. By John B. Deaver, M.D. . 260
Fatal Acetonæmia following an Operation for Acute Appendicitis. By George Emerson Brewer, M.D. . . . 271
Two Cases of Exophthalmic Goitre Treated by Operation. By Emmet Rixford, M.D. 285
Excision of the Lumbar Lymphatic Nodes and Spermatic Vein in Malignant Disease of the Testicle. By J. B. Roberts, M.D. 297
The Influence of the Roentgen Ray upon the Different Varieties of Sarcoma. By William B. Coley, M.D. . . . 308
The "Circulus Vitiosus" following Gastro-enterostomy, with a Description of a New Operation Designed to Prevent Its Occurrence. By George Ryerson Fowler, M.D. . . 335
Curvilinear Prerectal Operation for Prostatic Abscess. By Joseph Ransohoff, M.D., F.R.C.S. 353
The Implantation of Silver Filigree for the Closure of Large Hernial Apertures. By Willy Meyer, M.D. . . . 362

PAGE

Why Should We Not Treat the Gall-bladder as We Do the Appendix? By Roswell Park, M.D. 374
Shortening of the Radius in Colles' Fracture. By George Ryerson Fowler, M.D. 378
Cysts in Connection with the Teeth. By John Chadwick Oliver, M.D. 383
Operation for the Radical Cure of Aneurism Based upon Arteriorrhaphy, with the Report of Four Cases Successfully Operated upon by the Author. By Rudolph Matas, M.D. . . 396
The Present Status of the X-ray as a Means of Diagnosis and a Therapeutic Agent. By Arthur Dean Bevan, M.D. . . 435
Morcellement and Bisection of the Uterus in Complicated Abdominal Hysterectomy. By Willis G. Macdonald, M.D. . 452
Myomectomy vs. Hysterectomy. By Andrew J. McCosh, M.D. 458
The Choice Between the Suprapubic and the Infrapubic Methods of Reaching Tumors and Other Surgical Lesions of the Pelvic Organs. By Maurice H. Richardson, M.D. . . . 471
Abdominal Route for Approaching Rectal Tumors. By Robert Abbe, M.D. 474
An Improved Instrument. By S. H. Weeks, M.D. . . 496
Index to Vol. XX. 497

APPENDIX.

List of Officers and Fellows of the Association from 1880–1902 503
Index of Vols. I.–XX. (1880–1902) 515

LIST OF ILLUSTRATIONS.

PAGE

A Case of Severed Spinal Cord in Which Myelorrhaphy was followed by Partial Return of Function (Richard H. Harte and Francis T. Stewart) 33

Drainage-tube for Prostate Surgery (John E. Owens) . . 79

Pavilion F. of Albany Hospital (J. M. Mosher) . . . 140

Complications following Gastro-enterostomy (William J. Mayo) 151

A New Method of Pyloroplasty (J. M. T. Finney) . . . 165

Carcinoma Limited to the Appendix Vermiformis; Discussion of its Origin and its Relation to Appendicitis (Richard H. Harte and Robert N. Willson) 234

Excision of the Lumbar Lymphatic Nodes and Spermatic Vein in Malignant Disease of the Testicle (John B. Roberts) . 297

The Influence of the Roentgen Ray Upon the Different Varieties of Sarcoma (William B. Coley) 308

The "Circulus Vitiosus" following Gastro-enterostomy: With a Description of a New Operation Designed to Prevent Its Occurrence (George Ryerson Fowler) 335

The Implantation of Silver Filigree for the Closure of Large Hernial Apertures (Willy Meyer) 362

Shortening of the Radius in Colles' Fracture (George Ryerson Fowler) 379

An Operation for the Radical Cure of Aneurism Based upon Arteriorrhaphy (Rudolph Matas) 396

Morcellement and Bisection of the Uterus in Complicated Abdominal Hysterectomy (Willis G. Macdonald) . . 454

Myomectomy vs. Hysterectomy (Andrew J. McCosh) . . 458

OFFICERS OF THE ASSOCIATION,

ELECTED JUNE, 1902.

PRESIDENT.

MAURICE H. RICHARDSON, M.D.

VICE-PRESIDENTS.

N. B. CARSON, M.D.

W. J. MAYO, M.D.

SECRETARY.

DUDLEY P. ALLEN, M.D.,

278 Prospect Street, Cleveland.

TREASURER.

GEORGE RYERSON FOWLER, M.D.,

302 Washington Avenue, Brooklyn.

RECORDER.

RICHARD H. HARTE, M.D.,

1503 Spruce Street, Philadelphia.

COUNCIL.

DE FOREST WILLARD, M.D.

ROBERT F. WEIR, M.D.

ROSWELL PARK, M.D.

MAURICE H. RICHARDSON, M.D.,
DUDLEY P. ALLEN, M.D.,
GEORGE R. FOWLER, M.D.,
RICHARD H. HARTE, M.D.,
} *Ex-officio.*

PUBLICATION COMMITTEE.

RECORDER, SECRETARY AND TREASURER.

COMMITTEE ON ANNUAL MEETING.

W. L. RODMAN, M.D. J. D. BRYANT, M.D.

PRESIDENT, SECRETARY, RECORDER AND CHAIRMAN COMMITTEE OF ARRANGEMENTS.

CONGRESS OF AMERICAN PHYSICIANS AND SURGEONS, WASHINGTON MEETING, 1903.

Delegate: MAURICE H. RICHARDSON, M.D.

Alternate: JOSEPH D. BRYANT, M.D.

Place of next Meeting:

WASHINGTON, D. C., MAY 12, 13 and 14, 1903.

COMMITTEE OF ARRANGEMENTS.

J. F. THOMPSON, M.D.

L. M. TIFFANY, M.D.

G. B. JOHNSTON, M.D.

LIST OF THE PRESIDENTS

OF THE

ASSOCIATION FROM THE TIME OF ITS INSTITUTION.

ELECTED

1880.† SAMUEL DAVID GROSS, M.D., LL.D., D.C.L. OXON., LL.D. CANTAB., LL.D. EDIN.—Founder of the Association.

1883. EDWARD MOTT MOORE, M.D., LL.D.

1884.† WILLIAM THOMPSON BRIGGS, M.D.

1885.† MOSES GUNN, A.M., M.D., LL.D.

1886.† HUNTER McGUIRE, M.D., LL.D.

1887.† D. HAYES AGNEW, M.D., LL.D.

1888. DAVID WILLIAMS CHEEVER, M.D., LL.D.

1889.† DAVID W. YANDELL, M.D.

1890.† CLAUDIUS HENRY MASTIN, M.D., LL.D.

1891. PHINEAS SANBORN CONNER, M.D., LL.D.

1892. NICHOLAS SENN, M.D., PH.D., LL.D.

1893. J. EWING MEARS, A.M., M.D.

1894. FREDERIC SHEPARD DENNIS, M.D.

1895. LOUIS McLANE TIFFANY, A.M. CANTAB., M.D.

1896. JOHN COLLINS WARREN, M.D., LL.D. (JEFFERSON), HON. F.R.C.S. ENG.

1897. THEODORE F. PREWITT, M.D.

1898. WILLIAM W. KEEN, A.M., M.D., LL.D., HON. F.R.C.S. ENG.

1899. ROBERT F. WEIR, M.D.

1900. ROSWELL PARK, M.D.

1901. DE FOREST WILLARD, A.M., M.D., PH.D.

1902. MAURICE H. RICHARDSON, A.B., M.D.

† Deceased.

NOTICE.

THIS volume of TRANSACTIONS contains the papers read before the Association at the Meeting held June 3–5, 1902.

The Association assumes no responsibility for the statements and opinions published in this volume.

FELLOWS

OF THE

AMERICAN SURGICAL ASSOCIATION.

MAY, 1902.

* Denotes Original Fellows.

Elected

1890. ABBE, ROBERT. M.D., 13 West Fiftieth Street, New York. Surgeon to St. Luke's Hospital. *Vice-President*, 1901.

1894. ALLEN, DUDLEY P., A.M., M.D., *Secretary*, 278 Prospect Street, Cleveland, Ohio. Professor of Surgery, Medical Department of Western Reserve University; Visiting Surgeon, Lakeside and Charity Hospitals; Consulting Surgeon to the Cleveland City Hospital.

1890. ALLIS, OSCAR HUNTINGTON, A.M., M.D., 1604 Spruce Street, Philadelphia. Surgeon to the Presbyterian Hospital.

1902. ANDREWS, E. W., M.D., 100 State Street, Chicago, Ill.

1901. ARMSTRONG, GEORGE E., C.M., M.D., 320 Mountain Street, Montreal. Associate Professor of Clinical Surgery, McGill University; Surgeon to the Montreal General Hospital; Surgeon to the Western Hospital, Montreal.

1882. BARTON, JAMES M., A.M., M.D., 1337 Spruce Street, Philadelphia. Surgeon to the Jefferson Medical College Hospital and to the Philadelphia Hospital.

1896. BAXTER, GEORGE A., A.M., M.D., Chattanooga, Tennessee. Professor of Surgery, Chattanooga Medical College.

1901. BELL, JAMES, M.D., 873 Dorchester Street, Montreal. Professor of Clinical Surgery, McGill University; Surgeon to the Royal Victoria Hospital.

Elected

1900. BEVAN, ARTHUR DEAN, M.D., 100 State Street, Chicago. Associate Professor of Surgery, Rush Medical College, University of Chicago; Surgeon to Presbyterian Hospital.

1901. BINNIE, B. F., M.B., C.M. (Aberdeen), 12th and Wyandotte Streets, Kansas City, Mo. Professor of Surgical Pathology and Clinical Surgery, Kansas City Medical College.

1902. BLAKE, JOSEPH A., M.D., 601 Madison Avenue, New York. Instructor in Surgery, Columbia University; Attending Surgeon to St. Luke's Hospital; Junior Surgeon to the Roosevelt Hospital; Consulting Surgeon to the Northern Dispensary.

1901. BLOODGOOD, JOSEPH C., B.S., M.D., 923 North Charles Street, Baltimore, Md. Associate in Surgery in the Johns Hopkins University.

1882. BONTECOU, REED BROCKWAY, M.D., 82 Fourth Street, Troy, N. Y. Surgeon to the Marshall Infirmary.

1901. BOSHER, LEWIS C., M.D., 717 Franklin Street, Richmond, Va. Professor of Surgery, Medical College of Virginia; Surgeon to the Old Dominion Hospital.

1890. BRADFORD, EDWARD HICKLING, A.B., M.D., 133 Newbury Street, Boston. Surgeon to the Children's and the Samaritan Hospitals; Assistant Professor of Orthopedic Surgery in the Harvard University.

1900. BREWER, GEORGE EMERSON, M.D., 68 West Forty-sixth Street, New York City. Junior Surgeon, Roosevelt Hospital; Attending Surgeon, City Hospital; Assistant Demonstrator of Anatomy in College of Physicians and Surgeons (Columbia University), New York.

*1880. BRINTON, JOHN H., M.D., 1423 Spruce Street, Philadelphia. Professor of the Practice of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to St. Joseph's Hospital. *Treasurer*, 1884–85.

1895. BRYANT, JOSEPH D., M.D., 54 West Thirty-sixth Street, New York. Professor of Anatomy and of Operative and Clinical Surgery, Bellevue Hospital Medical College; Surgeon to Bellevue and St. Vincent's Hospitals; Consulting Surgeon to Gouverneur Hospital, Hospital for Ruptured and Crippled, St. Joseph's and Hackensack Hospitals, Asylum for Insane, New York, etc.

Elected

1882. Bull, William Tillinghast, A.B., M.D., 35 West Thirty-fifth Street, New York. Adjunct Professor of the Practice of Surgery and of Clinical Surgery in the College of Physicians and Surgeons, New York; Surgeon to the New York and St. Luke's Hospitals; Consulting Surgeon to the Hospital for Ruptured and Crippled, and to the New York Cancer Hospital.

1900. Bunts, Frank E., M.D., Osborn Building, 275 Prospect Street, Cleveland, Ohio. Professor of Principles of Surgery and Clinical Surgery in Medical College of Western Reserve University; Visiting Surgeon to St. Vincent's Charity Hospital; Consulting Surgeon to Cleveland City and Lutheran Hospitals.

1893. Burrell, Herbert Leslie, M.D. (Harvard), 22 Newbury Street, Boston, Mass. Assistant Professor of Surgery in Harvard University; Visiting Surgeon, Boston City Hospital; Visiting Surgeon, The Children's Hospital; Consulting Surgeon, Carney Hospital and the Quincy Hospital. *Secretary*, 1895–1901.

1889. Cabot, Arthur Tracy, A.M., M.D., 3 Marlborough Street, Boston, Mass. Surgeon to the Massachusetts General Hospital.

1885. Carmalt, William H., A.M., M.D., 87 Elm Street, New Haven, Conn. Professor of Surgery in Yale University; Surgeon to the New Haven Hospital. *Vice-President*, 1895.

1896. Carson, Norman Bruce, M.D., *Vice-President*, 3561 Olive Street, St. Louis, Mo. Professor of Clinical Surgery in the St. Louis Medical College; Surgeon to the St. Louis and Mullanphy Hospitals and to the St. Vincent Insane Asylum, etc.

1882. Cheever, David Williams, M.D., LL.D., 557 Boylston Street, Boston, Mass. Professor of Surgery (Emeritus) in Harvard University; Surgeon to the Boston City Hospital. *President*, 1888.

1896. Cole, Charles Knox, A.M., M.D., Helena, Montana. Surgeon to St. John's, St. Peter's, and County Hospitals.

Elected

1898. Coley, William B., M.D., 5 Park Avenue, New York. Attending Surgeon to the New York Cancer Hospital; Assistant Surgeon to the Hospital for the Ruptured and Crippled.

*1880. Conner, Phineas Sanborn, M.D., LL.D., 159 West Ninth Street, Cincinnati, Ohio. Professor of Surgery in the Medical College of Ohio; Emeritus Professor of Surgery, Dartmouth Medical College; Surgeon to the Cincinnati and the Good Samaritan Hospitals. *President*, 1891; *Member of Council*, 1883 and 1895–1900; *Treasurer*, 1885–91.

1896. Curtis, Benjamin Farquhar, A.B., M.D., 7 East Forty-first Street, New York. Professor of the Principles of Surgery and Clinical Surgery, University and Bellevue Hospital Medical College of New York; Attending Surgeon to St. Luke's and Bellevue Hospitals, and the General Memorial Hospital for Treatment of Cancer and Allied Diseases; Consulting Surgeon to New York Orthopedic Hospital and Dispensary.

1896. Cushing, Hayward Warren, A.B., M.D., 70 Commonwealth Avenue, Boston, Mass. Junior Visiting Surgeon, Boston City Hospital; Assistant Surgeon, Children's Hospital, Boston.

1897. Da Costa, John Chalmers, M.D., 2045 Walnut Street, Philadelphia, Pa. Clinical Professor of Surgery, Jefferson Medical College; Surgeon to the Philadelphia and the Phœnixville Hospitals.

1883. Dandridge, Nathaniel Pendleton, M.D., 422 Broadway, Cincinnati, Ohio. Professor of Practice of Surgery and of Clinical Surgery in the Miami Medical College, Cincinnati. *Treasurer*, 1894–96.

1892. Deaver, John B., M.D., 1634 Walnut Street, Philadelphia. Surgeon to the German Hospital, Philadelphia.

1882. Dennis, Frederic Shepard, M.D., F.R.C.S. Eng., 542 Madison Avenue, New York. Professor of Clinical Surgery, Cornell University, New York City; Visiting Surgeon to the Bellevue and St. Vincent's Hospitals; Consulting Surgeon to St. Joseph's Hospital, Yonkers, and Montefiore Home, New York City. *President*, 1894; *Vice-President*, 1887; *Member of Council*, 1889.

Elected

1899. DUNN, JAMES H., M.D., 337 Oak Grove Street, Minneapolis, Minn. Professor of Practice of Surgery, Medical Department, University of Minnesota.

1901. ELIOT, ELLSWORTH, JR., M.D., 48 West Thirty-sixth Street, New York. Clinical Lecturer and Demonstrator of Surgery, College of Physicians and Surgeons, New York; Surgeon to the Presbyterian Hospital.

1893. ELLIOT, JOHN WHEELOCK, A.M., M.D. (Harvard), 124 Beacon Street, Boston. Surgeon to Massachusetts General Hospital.

1896. ESTES, WILLIAM LAWRENCE, A.M., M.D., South Bethlehem, Penna. Director and Surgeon-in-Chief of St. Luke's Hospital; Lecturer on Hygiene at Lehigh University.

1898. EVE, DUNCAN, A.M., M.D., 700 Church Street, Nashville, Tenn. Professor of Surgery and Clinical Surgery, Medical Department, Vanderbilt University; Surgeon to the Nashville City Hospital.

1901. FERGUSON, ALEX. HUGH, C.M., M.D., 452 East Forty-ninth Street, Chicago. Professor of Clinical Surgery in the Medical Department of the University of the State of Illinois; Professor of Surgery in the Post-Graduate Medical School of Chicago; Surgeon-in-Chief of the Chicago Hospital; Surgeon to Cook County Hospital for the Insane; Consulting Surgeon to Provident Hospital.

1899. FINNEY, JOHN M. T., M.D., 1300 Eutaw Place, Baltimore, Md. Associate Professor of Surgery, Johns Hopkins University.

1882. FORBES, WILLIAM SMITH, M.D., 901 Pine Street, Philadelphia. Professor of Anatomy in the Jefferson Medical College of Philadelphia.

1891. FOWLER, GEORGE RYERSON, M.D., *Treasurer*, 301 De Kalb Avenue, Borough of Brooklyn, New York City. Professor of Surgery, New York Polyclinic; Examiner in Surgery, Medical Examining Board of Regents, University of State of New York; Surgeon to the Methodist Episcopal, German, and Brooklyn Hospitals; Consulting Surgeon to St. Mary's and Norwegian Relief (E. D.) Hospitals.

Elected

1898. FREEMAN, LEONARD, B.S., M.D., California Building, Denver, Col. Professor of Surgery, Gross Medical College; Surgeon to the Arapahoe County Hospital and to St. Anthony's Hospital.

1891. GASTON, JAMES MCFADDEN, A.B., M.D., 421 Capitol Avenue, Atlanta, Georgia. Professor of Surgery in Southern Medical College. *Vice-President*, 1897.

1882. GAY, GEORGE WASHINGTON, A.M., M.D., 665 Boylston Street, Boston, Mass. Senior Surgeon to the Boston City Hospital; Clinical Instructor in Surgery in Harvard University. *Member of Council*, 1882.

1892. GERRISH, FREDERIC HENRY, A.M., M.D., 675 Congress Street, Portland, Maine. Consulting Surgeon, Maine General Hospital; Professor of Anatomy in Medical Department of Bowdoin College.

1890. GERSTER, ARPAD G., M.D., Chir. D., 34 East Seventy-fifth Street, New York. Professor of Surgery in the New York Polyclinic; Surgeon to the German and Mount Sinai Hospitals.

1892. HALSTED, WILLIAM STEWART, B.A., M.D., 1201 Eutaw Place, Baltimore, Maryland. Surgeon to Johns Hopkins Hospital.

1898. HARRINGTON, FRANCIS B., A.B. (Tufts College), M.D. (Harvard College), 201 Beacon Street, Boston, Mass. Surgeon to Massachusetts General Hospital.

1901. HARRIS, MALCOLM L., M.D., 100 State Street, Chicago, Ill. Professor of Surgery, Chicago Polyclinic; Attending Surgeon, Alexian Brothers' Hospital, St. Luke's Hospital, and Maurice Porter Hospital for Children.

1895. HARTE, RICHARD H., M.D., *Recorder*, 1503 Spruce Street, Philadelphia. Surgeon to the Pennsylvania and Episcopal Hospitals; Consulting Surgeon, St. Mary's, St. Timothy's, and Bryn Mawr Hospitals.

1898. HEARN, W. JOSEPH, M.D., 1120 Walnut Street, Philadelphia. Clinical Professor of Surgery, Jefferson Medical College; Visiting Surgeon to the Philadelphia Hospital; Consulting Surgeon to the Phœnixville General Hospital.

1889. HOMANS, JOHN, A.B., M.D., 164 Beacon Street, Boston. Surgeon to the Massachusetts General Hospital.

Elected

1899. HORWITZ, ORVILLE, M.D., 1721 Walnut Street, Philadelphia. Clinical Professor of Genito-Urinary Diseases, Jefferson Medical College; Surgeon to the Philadelphia Hospital; Consulting Surgeon to State Hospital for Insane and Hayes Mechanics' Home.

1901. HUNTINGTON, THOMAS W., A.B., M.D., 406 Sutter Street, San Francisco, California. Professor of Clinical and Operative Surgery, Medical Department, University of California; Visiting Surgeon to the City and County Hospital, San Francisco; Consulting Surgeon, St. Luke's Hospital, San Francisco.

1901. JACOBSON, NATHAN, M.D., 430 South Salina Street, Syracuse, N.Y. Professor of Clinical Surgery, College of Medicine, Syracuse University; Surgeon to St. Joseph's Hospital.

1901. JOHNSON, ALEXANDER B., M.D., 12 East Fifty-eighth Street, New York. Professor of Clinical Surgery, Cornell University Medical College; Attending Surgeon to New York Hospital.

1896. JOHNSTON, GEORGE BEN, M.D., 207 East Grace Street, Richmond, Va. Professor of the Practice of Surgery and of Clinical Surgery in the Medical College of Virginia; Surgeon to the Old Dominion Hospital, and Consulting Surgeon to the Richmond City Free Dispensary.

1901. JONAS, A. F., M.D., Continental Block, Omaha, Nebraska. Professor of Surgery, Omaha Medical College; Surgeon to the Methodist Episcopal Hospital and to the Douglas County Hospital.

1899. KAMMERER, FREDERICK, M.D., 51 East Sixty-sixth Street, New York City. Professor of Clinical Surgery, Cornell Medical College; Surgeon to the German and St. Francis' Hospitals, New York.

*1880. KEEN, WILLIAM WILLIAMS, A.M., M.D., LL.D., Hon. F.R.C.S., Eng.[4], 1729 Chestnut Street, Philadelphia. Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to the Jefferson Medical College Hospital and to the Orthopædic Hospital and Infirmary for Nervous Diseases; Consulting Surgeon to the Woman's and St. Agnes' Hospitals; Membre Correspondant

Elected

Etrangé de la Société de Chirurgie de Paris; Membre Honoraire de la Société Belge de Chirurgie. *President*, 1898; *Vice-President*, 1892; *Member of Council*, 1899–1901.

1901. La Garde, Louis A., M.D., United States Soldiers' Home, Washington, D.C. Professor of Military Surgery, New York University and Bellevue Hospital Medical College; Major and Surgeon United States Army.

1901. Le Conte, Robert G., A.B., M.D., 1530 Locust Street, Philadelphia. Surgeon to the Pennsylvania, the Children's, and the Bryn Mawr Hospitals.

1889. Lange, Frederick E., M.D., 691 Lexington Avenue, New York.

1901. McArthur, L. L., M.D., 4415 Drexel Building, Chicago, Ill. Professor of Clinical Surgery, Post-Graduate Medical School; Assistant Professor of Clinical Surgery, Rush Medical College; Surgeon to St. Luke's and Michael Reese Hospitals.

1896. McCosh, Andrew J., B.A., M.D., 16 East Fifty-fourth Street, New York. Surgeon to the Presbyterian Hospital; Clinical Lecturer on Surgery, College of Physicians and Surgeons.

1882. McGraw, Theodore A., M.D., 73 Case Street, Detroit, Michigan. Professor of Surgery in the Detroit Medical College; Surgeon to St. Mary's and the Harper Hospitals. *Vice-President*, 1896.

1901. Macdonald, Willis G., M.D., 27 Eagle Street, Albany, New York.

1899. Markoe, Francis H., M.D., 15 East Forty-ninth Street, New York. Professor of Clinical Surgery, Medical Department Columbia University, New York City; Attending Surgeon, St. Luke's and New York Hospitals; Consulting Surgeon, Orthopædic Hospital.

*1880. Marks, Solon, M.D., 136 Wisconsin Street, Milwaukee, Wis. Surgeon to St. Mary's Hospital. *Vice-President*, 1898.

1898. Martin, Edward, M.D., 415 South Fifteenth Street, Philadelphia. Clinical Professor of Surgery, University of Pennsylvania; Clinical Professor of Surgery, Woman's Medical College, Philadelphia; Surgeon to Philadelphia, St. Agnes', and Howard Hospitals.

Elected

1887. MASTIN, WILLIAM MCDOWELL, M.D., Northwest corner of Joachim and Conti Streets, Mobile, Ala. Surgeon to the Mobile City Hospital.

1895. MATAS, RUDOLPH, M.D., 2255 St. Charles Avenue, New Orleans, La. Professor of Surgery, Medical Department, Tulane University; Professor of Clinical Surgery, New Orleans Polyclinic; Surgeon to Charity Hospital; Consulting Surgeon to the Eye, Ear, Nose, and Throat Hospital. *Vice-President*, 1901.

1899. MAYO, WILLIAM J., A.M., M.D., *Vice-President*, 427 West College Street, Rochester, Minn. Surgeon to St. Mary's Hospital.

*1880. MEARS, J. EWING, A.M., M.D., 1429 Walnut Street, Philadelphia. *President*, 1893; *Recorder*, 1881–93.

1901. MEYER, WILLY, M.D., 700 Madison Avenue, New York. Professor of Surgery in the New York Post-Graduate Medical School and Hospital; Attending Surgeon to the German and New York Skin and Cancer Hospitals; Consulting Surgeon to the New York Infirmary for Women and Children.

1893. MIXTER, SAMUEL JASON, S.B. (Massachusetts Institute of Technology), M.D. (Harvard), 180 Marlborough Street, Boston. Surgeon to Massachusetts General Hospital and to Carney Hospital; Consulting Surgeon to the Massachusetts Charity Eye and Ear Infirmary; Instructor in Surgery in the Harvard University.

1896. MONKS, GEORGE HOWARD, A.B. (Harvard), M.D. (Harvard), M.R.C.S. Eng., 67 Marlborough Street, Boston. Surgeon to Carney Hospital; Assistant Visiting Surgeon, Boston City Hospital; Instructor in Clinical and Assistant in Operative Surgery, Harvard Medical School; Instructor in Surgical Pathology, Harvard Dental School.

1895. MOORE, JAMES E., M.D., 704 Pillsbury Building, Minneapolis, Minn. Professor of Clinical Surgery, University of Minnesota; Surgeon to St. Barnabas' and Northwestern Hospitals; Consulting Surgeon to St. Mary's and City Hospitals.

*1880. MORTON, THOMAS GEORGE, M.D., 1617 Chestnut Street, Philadelphia. Surgeon to the Pennsylvania, and Consulting Surgeon to the Orthopædic and Jewish Hospitals.

Elected

1898. MORTON, THOMAS S. K., M.D., 1506 Locust Street, Philadelphia. Professor of Surgery, Philadelphia Polyclinic and College for Graduates in Medicine; Surgeon to the Out-Patient Department of the Pennsylvania Hospital; Consulting Surgeon to the Woman's Hospital.

1900. MUNRO, JOHN C., M.D., 173 Beacon Street, Boston. Instructor in Surgery, Harvard; Professor of Surgery, Tufts College Dental School; Assistant Visiting Surgeon, Boston City Hospital.

1902. MURPHY, JOHN B., A.M., M.D., Reliance Building, Chicago, Ill. Professor of Surgery, Medical Department of Northwestern University, Chicago Post-Graduate School and Hospital, and Chicago Clinical School; Attending Surgeon to Mercy Hospital, Cook County Hospital, and Wesley Hospital; Consulting Surgeon to Alexian Brothers' Hospital, and Hospital for Crippled Children.

1898. MURRAY, FRANCIS W., M.D., 32 West Thirty-ninth Street, New York City. Professor of Clinical Surgery in Cornell University Medical College; Surgeon to the New York and St. Luke's Hospitals.

1882. NANCREDE, CHARLES BEYLARD, A.M. (University of Pennsylvania), M.D., LL.D. (Jefferson), Southwest corner Thayer Street and South University Avenue, Ann Arbor, Mich. Professor of Surgery in the University of Michigan; Professor of Surgery, Dartmouth Medical College. *Vice-President*, 1889 and 1899.

1900. OCHSNER, A. J., B.S., F.R.M.S., M.D. (Eng.), 710 Sedgwick Street, Chicago. Professor of Clinical Surgery, College of Physicians and Surgeons; Surgeon-in-Chief of Augustana and St. Mary's Hospitals.

1900. OLIVER, J. C., M.D., Berkshire Building, 628 Elm Street, Cincinnati, Ohio. Professor of Descriptive Anatomy, Miami Medical College; Surgeon, Cincinnati, Presbyterian, and Christ Hospitals.

1882. OWENS, JOHN E., M.D., 1806 Michigan Avenue, Chicago. Professor of Principles and Practice of Surgery and Clinical Surgery in the Chicago Medical College; Surgeon to St. Luke's Hospital. *Vice-President*, 1900.

Elected

1899. PARHAM, FREDERICK WILLIAM, M.D., 1429 Seventh Street, New Orleans, La. Professor of General Clinical and Operative Surgery on the Cadaver, New Orleans Polyclinic; Surgeon, Charity Hospital; Consulting Surgeon, Eye, Ear, Nose, and Throat Hospital.

1885. PARK, ROSWELL, A.M., M.D., 510 Delaware Avenue, Buffalo, N. Y. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital. *President*, 1900; *Vice-President*, 1893; *Member of Council*, 1893–94, 1901–02.

1893. PARMENTER, JOHN, M.D., 519 Franklin Street, Buffalo, N. Y. Professor of Anatomy and Clinical Surgery in the Medical Department of the University of Buffalo; Surgeon to the Sisters of Charity, Erie County, Fitch, Children's, and Emergency Hospitals; Assistant Surgeon, Buffalo General Hospital.

1889. PILCHER, LEWIS S., A.M., M.D., LL.D. (Dickinson), 145 Gates Avenue, Brooklyn, N.Y. Professor of Clinical Surgery in the Post-Graduate Medical School, New York; Surgeon to the Methodist Episcopal Hospital. *Vice-President*, 1893.

1887. PORTER, CHARLES BURNHAM, A.M., M.D. (Harvard), 5 Arlington Street, Boston, Mass. Professor of Clinical Surgery in Harvard University; Surgeon to the Massachusetts General Hospital. *Vice-President*, 1892.

1882. PORTER, WILLIAM GIBBS, M.D., 1118 Spruce Street, Philadelphia. Surgeon to the Presbyterian Hospital.

1896. POWERS, CHARLES A., M.D., Fourteenth and Stout Streets, Denver, Col. Professor of Surgery in the University of Denver, and Surgeon to the Arapahoe County Hospital and to St. Luke's Hospital.

1882. PREWITT, THEODORE F., M.D., 3101 Pine Street, St. Louis, Mo. Professor of the Principles of Surgery in the Medical Department of Washington University; Surgeon to St. John's Hospital. *President*, 1897; *Vice-President*, 1886; *Member of Council*, 1894–96.

1886. RANSOHOFF, JOSEPH, M.D., F.R.C.S. Eng., 706 Walnut Street, Cincinnati, Ohio. Professor of Anatomy in the Medical College of Ohio; Surgeon to the Cincinnati and the Good Samaritan Hospitals.

Elected

1887. RICHARDSON, MAURICE HOWE, A.B., M.D., *President*, 224 Beacon Street, Boston, Mass. Surgeon to the Massachusetts General Hospital; Assistant Professor of Clinical Surgery in Harvard University. *Vice-President*, 1897; *Secretary*, 1894–96.

1901. RIXFORD, EMMET, B.S., M.D., 1400 Van Ness Avenue, San Francisco, Cal. Professor of Surgery in Cooper Medical College; Surgeon to the City, County, and Lane Hospitals.

1882. ROBERTS, JOHN B., A.M., M.D., 1627 Walnut Street, Philadelphia. Professor of Anatomy and Surgery in the Philadelphia Polyclinic; Surgeon to the Methodist and Jewish Hospitals. *Vice-President*, 1888 and 1894; *Treasurer*, 1892–93.

1898. RODMAN, WILLIAM L., A.M., M.D., 1626 Spruce Street, Philadelphia. Professor of the Principles of Surgery and Clinical Surgery in the Medico-Chirurgical College, Philadelphia; Professor of the Principles and Practice of Surgery and Clinical Surgery in the Woman's Medical College, Philadelphia.

1882. RUSHMORE, JOHN DIKEMAN, M.D., 129 Montague Street, Brooklyn, N. Y. Professor of Surgery in the Long Island College Hospital; Surgeon to the Brooklyn, St. Peter's, and the Eye and Ear Hospitals.

1882. SENN, NICHOLAS, M.D., Ph.D., LL.D. (Jefferson), 532 Dearborn Avenue, Chicago, Ill. Professor of the Principles of Surgery and Clinical Surgery in Rush Medical College; Surgeon to Presbyterian Hospital; Surgeon-in-Chief to St. Joseph's Hospital. *President*, 1892; *Member of Council*, 1897.

1902. SHEPHERD, FRANCIS J., M.D., 152 Mansfield Street, Montreal, Canada. Professor of Anatomy and Lecturer on Operative Surgery in McGill University, Montreal; Senior Surgeon to the Montreal General Hospital.

1895. SOUCHON, EDMOND, M.D., 135 Baronne Street, New Orleans, La. Professor of Anatomy and of Clinical Surgery, Tulane University; Surgeon to Charity Hospital; Consulting Surgeon to the Eye, Ear, Nose, and Throat Hospital. *Vice-President*, 1899.

Elected

1900. TAYLOR, WILLIAM J., M.D., 1825 Pine Street, Philadelphia. Surgeon to the Orthopædic Hospital and Infirmary for Nervous Diseases, and to St. Agnes' Hospital; Consulting Surgeon to the West Philadelphia Hospital for Women.

1885. THOMPSON, J. FORD, M.D., 1401 H Street, N. W., Washington, D. C. Professor of Surgery in the National Medical College; Surgeon to the Garfield Memorial and the Children's Hospitals.

1882. THOMSON, WILLIAM, M.D., 1426 Walnut Street, Philadelphia. Emeritus Professor of Ophthalmology in the Jefferson Medical College.

1882. TIFFANY, LOUIS MCLANE, A.M. (Cantab.), M.D., 831 Park Avenue, Baltimore, Md. *President*, 1895; *Member of Council*, 1885–89, and 1896–7.

1882. VANDER VEER, ALBERT, A.M., M.D., Ph.D., 28 Eagle Street, Albany, N. Y. Dean of Albany Medical College; Professor of Didactic Abdominal Surgery and of Clinical Surgery in the Albany Medical College; Consulting Surgeon to St. Peter's Hospital; Attending Surgeon to the Albany Hospital. *Vice-President*, 1898.

1902. VAUGHAN, GEORGE TULLY, M.D., 1718 I Street, Washington, D.C. Professor of Principles and Practice of Surgery, Georgetown University; Professor of Surgery and Genito-Urinary Surgery, Washington Post-Graduate Medical School; Chief Surgeon, Georgetown University Hospital; Surgeon, Emergency Hospital; Consulting Surgeon, Government Hospital for the Insane, Washington, D. C.; Assistant Surgeon-General, U. S. Public Health and Marine Hospital Service.

1891. WALKER, EDWARD W., M.D., 96 West Eighth Street, Cincinnati, Ohio. Professor of Surgery, Miami Medical College.

1882. WARREN, JOHN COLLINS, M.D., LL.D. (Jefferson), Hon. F.R.C.S. Eng., 58 Beacon Street, Boston, Mass. Professor of Surgery in Harvard University; Surgeon to the Massachusetts General Hospital. *President*, 1896; *Vice-President*, 1890; *Member of Council*, 1897.

Elected

1896. WATSON, FRANCIS SEDGWICK, A.B., M.D., 92 Marlborough Street, Boston. Surgeon to the Boston City Hospital; Instructor in Genito-Urinary Surgery, Harvard Medical School.

1889. WEEKS, STEPHEN H., M.D., 662 Congress Street, Portland, Maine. Professor of Surgery in the Medical School of Maine; Surgeon to Maine General Hospital. *Member of Council*, 1893.

1889. WEIR, ROBERT F., A.M., M.D., Hon. F.R.C.S. Eng., Cor. Mem. Surg. Soc., Paris, 11 East Fifty-fourth Street, New York. Professor of Surgery in the College of Physicians and Surgeons, Columbia University; Surgeon to the Roosevelt Hospital. *President*, 1899. *Member of Council*, 1893–1896, 1901–02.

1892. WHARTON, HENRY R., A.M., M.D., 1725 Spruce Street, Philadelphia. Surgeon to the Presbyterian, Children's, and Methodist Hospitals.

1882. WHITE, J. WILLIAM, M.D., Ph.D., 1810 South Rittenhouse Square, Philadelphia. John Rhea Barton Professor of Surgery in the University of Pennsylvania.

1882. WILLARD, DE FOREST, A.M., M.D. (Univ. of Pa.), Ph.D., 1818 Chestnut Street, Philadelphia. Clinical Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the Hospital for the Chronic Insane of Pennsylvania, and to the New Jersey Training School. *President*, 1901; *Recorder*, 1893–1900; *Member of Council*, 1901.

1901. WOOLSEY, GEORGE, M.D., 117 East Thirty-sixth Street, New York City. Professor of Anatomy and Clinical Surgery, Cornell University; Surgeon to Bellevue Hospital; Associate Surgeon to the Presbyterian Hospital.

HONORARY FELLOWS.

Elected

1885. ANNANDALE, THOMAS, M.R.C.S. Eng., M.D. Edin., 34 Charlotte Square, Edinburgh, Scotland. Regius Professor of Clinical Surgery in the University of Edinburgh.

1894. VON BERGMANN, PROF. DR. ERNST, Geh. Med. Rath., Klin. Institut für Chirurgie, Berlin, Germany.

1891. BRYANT, THOMAS, ESQ., F.R.C.S. Eng., 65 Grosvenor Street, Grosvenor Square, W., London.

1891. CHIENE, JOHN, F.R.C.S. Edin., M.D. Edin., 26 Charlotte Square, Edinburgh, Scotland. Professor of Surgery in the University of Edinburgh.

1885. CZERNY, PROF. DR. VINCENT, 25 Sophien Strasse, Heidelberg, Germany. Professor of Surgery in the University of Heidelberg.

1885. VON ESMARCH, PROF. DR. FRIEDRICH, 2 Hospitalberg, Kiel, Schleswig-Holstein, Germany. Professor of Surgery in the University of Kiel.

1893. GUSSENBAUER, PROF. DR. CARL, ix. Ferstelgasse, Vienna. Imperial and Royal Professor of Surgery and Chief of the Second Surgical Clinic and of the Surgical Institute.

1891. HARRISON, REGINALD, ESQ., F.R.C.S. Eng., 6 Lower Berkeley Street, Portman Square, W., London.

1890. HORSLEY, VICTOR ALEXANDER HADEN, F.R.C.S. Eng., 25 Cavendish Square, W., London.

1883. HORWITZ, P. J., M.D., 1919 Walnut Street, Medical Director U. S. Navy (Retired), Philadelphia.

Elected

1894. KOCHER, PROF. DR. THEODOR, Professor of Surgery, University of Berne, Villette 25, Berne, Switzerland.

1885. LISTER, LORD JOSEPH, F.R.C.S. Eng., D.C.L., LL.D., 12 Park Crescent, London, N. W. Professor of Clinical Surgery in King's College.

1894. MACEWEN, WILLIAM, M.D., Mast. Surg., 3 Woodside Crescent, Glasgow, Scotland.

*1880. MOORE, EDWARD MOTT, M.D., LL.D., 74 South Fitzhugh Street, Rochester, N. Y. Surgeon to St. Mary's Hospital. *President*, 1884.

1894. SCHEDE, PROF. DR. M. H. E. W., Geh. Med. Rath., Director of Surgery, University Clinic, Bonn, Germany.

1882. SMITH, STEPHEN, A.M., M.D., LL.D., 574 Madison Avenue, New York. Professor of Clinical Surgery in the University Medical College of New York; Surgeon to the Bellevue and the St. Vincent's Hospitals. *Vice-President*, 1890.

1896. TERRIER, DR. FELIX, 3 Rue de Copenhague, Paris. Professor of Operative Surgery in the Faculty of Medicine of Paris; Surgeon to the Hôpital Bichat.

* Original Fellow.

ADDRESS OF THE PRESIDENT.

By De FOREST WILLARD, M.D.,
PHILADELPHIA.

To be the unexpected recipient of an election to the presidency of an Association composed of the best surgical talent of the world is an honor that may well be prized by any American surgeon. To say that I was gratified by such an expression of your confidence is to put the matter in the feeblest of terms. The man who would not be proud of such a token of your trust would not have been worthy of your selection, and I can truly say that no honor has ever come to me which has been so highly prized as this mark of esteem from my surgical brethren.

As the programme before you promises enough to store your brains with surgical subjects during the next three days, I refrain from further taxing your mental abilities by the discussion of any one of the surgical problems which must daily come into the mind of an active surgeon; but as one of the earlier Fellows of the Association, I have felt that it might not be uninteresting to all of you to turn back for a few moments to the history of the organization.

The idea of an Association that should represent the advanced surgical thought and action of the leaders in the profession originated with the elder Gross. First, at the meeting of the American Medical Association in Atlanta, in 1879, and the following year in New York, he discussed the matter with Briggs, Dawson, Campbell, and others. An organization was effected, and the following year a small number of surgeons met informally at Coney Island after a further impetus received at the

meeting of the American Medical Association at Richmond. I well remember the dignified form of Gross, as we stood in the Capitol grounds in Richmond, while he urged the advantages to be obtained by the scientific discussion of surgical subjects in a small body of selected men. In 1882 a full programme was presented, and a formal meeting held in Philadelphia. This was largely attended by such men as Gross, Agnew, Kinloch, Connor, and others.

The first Constitution of the Association placed the limit of essays at two papers to be read each day, in order that discussion might be full.

The first volume of TRANSACTIONS was issued in 1883, and contained the papers read at the first three meetings. This volume to-day gives us an interesting insight into the surgery of that date. Cœliotomy was at that time a comparatively rare operation. Listerism and the antiseptic treatment of germs were in their infancy, and we find in this volume such expressions as the following: "May we not be mistaken in regard to the fact that micrococci produce suppuration?" Again, "I have always been a consistent anti-Listeric surgeon; I have never treated a single wound by closure after the Listerian plan." "If it were true that unfavorable symptoms which follow certain operations are due to the presence of bacteria in the wound, or in the blood, then the Listerian plan, in my opinion, is the wrong one; it cannot succeed." "I do not think that Listerism is going to die; it *is* dead; few surgeons will long continue to use it." Letievant is quoted as saying, "I am satisfied that this theory of microscopical organisms is not the correct one." Again, "There are Fellows in this Association who are ready to raise their hands and thank God that they have never witnessed the application of Listerism, nor used it."

At that time the use of the spray was considered an essential part of Listerism; in fact, the spray was looked upon as the chief element, since the micro-organisms in the air were considered to be the ones especially dangerous. The question of cleanliness of hands, instruments, dressings, etc., was only beginning to be considered. Keith only a year before, at the International

Medical Congress at London, had publicly proclaimed the recantation of his faith in the spray. Hueter's doctrine, that severe injuries could be inflicted without inflammation, if germs were excluded, was considered extravagant. Tait, as we all know, was consistent in his cleanliness, but in regard to antisepticism, he congratulates himself as entitled to some credit for having "burst one of the largest, most blown, and most attractive bubbles ever displayed to a surgical audience." Dr. John L. Atlee, one of the pioneers of ovariotomy, at this time had only practised Listerism in a single case, but he had for many years used a weak solution of carbolic acid in keeping hands, sponges, and instruments clean.

Cabell, however, in this volume, gave an interesting résumé of the subject as it appeared at that time, proving conclusively that in spite of the opponents of the measure, the mortality of several operations had been greatly reduced, and that Spencer Wells had lowered his mortality in ovariotomy from 24 per cent. to 4 per cent.

Paget only two years before had stated that until recently he had never seen a patient recover who had a lumbar abscess opened by free incision, but now, he added, "I have seen several opened with absolute impunity under antiseptic treatment."

Savary had already fortunately struck the keynote of asepsis, and was urging the free irrigation of wounds with sterile boiled water, and Watson Cheyne had announced that Lister had become convinced that the spray was the least important of several antiseptic means, as there were undoubtedly fewer organisms floating in the air than were lodged on the hands and instruments. While Lister himself laid great stress upon the careful application of his carbolized dressings, other surgeons confounded antisepticism with the more spectacular portion of the procedure—the spray.

Bantock also had already begun diluting his spray and solutions, so as to reduce the whole question to one of cleanliness, which he concluded was, after all, the secret and merit of Listerism.

Personally, I had become a convert to the theory of the infection of wounds by micro-organisms six or seven years previous, at the time of Lister's visit to Philadelphia. The argument that impressed me most was the statement that he was able by his method to open joints with the absolute certainty that no infection would occur.

In regard to the aseptic instinct of a surgeon, it seems to be born in him, yet I can scarcely understand the careless practice of some of the younger surgeons of to-day, who ought involuntarily to act and think aseptically. Many of them in their practice are noticeably more careless than some of us older ones who were obliged to unlearn our entire original technique.

Of the original Fellows of the Association only six remain upon our roll. Of our former Presidents, Gross, Moore, Briggs, Agnew, McGuire, Yandell, and Mastin have already passed away. To those strong and able Founders of this Association those of us who are older look back with the utmost reverence and respect, recalling the tall, commanding figure and impressive speech of Gross, the kindly, attractive presence of Agnew, the vigorous movements of Gunn, the hearty Southern frankness of Yandell.

So much for the past! What of the future, or, rather, What of the present? for it is the present that must have its influence upon the future. To-morrow's duties are never as imperative as those of to-day. It is clearly our part not only to maintain the past history of the Association, but to strive to keep it in the very front rank of American surgery, the foremost rank of the surgery of the world. The surgeons of the United States have for many years pushed to the front in the development and perfection of all that is useful in practical surgery, and whatever may have been our failure in the past to recognize the value of scientific and pathological surgical improvement, the fault can be no longer laid to our charge, since the profession is daily not only recognizing but adopting every pathological and laboratory improvement which experience shows to be of value in the prosecution of our practical work. At the present time a young man can obtain in our country not only all the surgical technique

that is necessary to his advancement, but also all the scientific laboratory instruction that is required for work of precision and skill. We do not run crazy over theories, since many theories are useless in practice, but whenever a fact is demonstrated and distinctly proven, no nation is more ready than we are to accept and put in practice all such suggestions. The examination of the blood and of all the secreta and excreta of the body, the chemical, physiological, and pathological aids to precision in diagnosis and treatment, are all greatly welcome, but the laboratory is and always should be taken as an adjunct and assistant to, not a supplanter of, clinical observation. Every good surgeon has attained, or ought to have attained, a degree of intuition, of knowledge, of insight, of the subtle mental power which we call good judgment, which should be of the greatest service in the recognition of diseased conditions. As in ordinary life all the good qualities of an individual may be lost by the absence of common-sense, so in surgical life may knowledge and preparation prove valueless in the absence of good judgment.

As I have already said, the future depends upon our action of the present. The present is all that is promised to us, and as we look over even the past year we can see the inroads that have been made upon our Fellowship.

Dr. Moore, the second President of the Association, a strong, vigorous figure in his time, has naturally by his extreme age passed somewhat into retirement. He died at the ripe age of eighty-two, having been in the profession for sixty-four years. He graduated from the University of Pennsylvania in 1838.

All of us remember the peculiarities and at the same time the most marked scientific abilities of our fellow-member, Dr. Christian Fenger. Enthusiastic and devoted to the study of pathology, he made a name for himself, and has left his mark upon the surgery of his adopted country that will long remain.

The western coast of our country has lost Dr. Levi C. Lane, who was ever ready with his influence and money to forward the work of the profession in San Francisco. Dr. Wight, of Brooklyn, a careful surgeon, has also gone to his reward.

One of the younger men, Clayton Parkhill, bright, energetic,

forceful, had opening before him a widening career of advancement, and we deeply regret that his surgical work was completed at the early age of forty-two.

Among our Honorary Fellows we have lost Sir William MacCormac, a London surgeon well known in civil and military practice.

MEMBERSHIP. In our Association should be gathered only the men who have made their mark in the surgical world by scientific advancement, by skilful technique, by thorough clinical knowledge, and by acknowledged pre-eminence in teaching power. It should never be our desire to close the doors against any surgeon who possesses these distinctive qualities and bears in addition a high character. Each year we should add new vigor and force and new working elements in order that the foundation may be broad and permanent. Favor, partiality, envy, jealousy, should have no place in our elections. The Fellow who permits personal prejudice to influence his vote in regard to the election of a Fellow is committing an injustice against the Association.

The plan of having names lie over for one year is an admirable one, and should be continued. If objectionable names are presented at this meeting it is the duty of Fellows to notify the Council in order that this body may be correctly informed of the qualifications of candidates.

The object of this Association is to select men of superior judgment and ripe experience. As has been truly said by one of our former Presidents, "the self-laudatory egotist must ever be a *persona non grata* to a body of men whose strongest motive is the love of their profession and whose highest aims are its advancement." There should be no spirit, however, of maintaining the false doctrine that all wisdom is here contained, for we know that with the rapidly advancing elements in American surgery the man who to-day has not attained to sufficient eminence may next year show the very qualifications that will make him a worthy Fellow.

In regard to increase of our membership: At our meeting in 1898, we enlarged our limit from one hundred to one hundred

and twenty-five, but in the space of four years we find that there are far more proposals for membership than we can possibly accommodate. My judgment in regard to expansion is very positively that it should be slow, and only as the necessities of the case exist—that is, when strong, able surgeons whom we desire in our Fellowship cannot be admitted on account of the lack of room. To open the doors wide to an unlimited number would greatly lessen the value of Fellowship in the Association, both to the present members and to those desiring to be admitted.

The Surgical Section of the American Medical Association is a body which is large enough to include all the worthy surgeons of the United States, and it should be our purpose to strengthen and help this organization in its most valuable career. It is a force of great power in bringing together old and young, experienced and inexperienced, from every State in the Union, and gives them an opportunity to show their qualifications and fitness for the more limited Association.

An unlimited number would also ruin our scientific work by increasing the number of papers beyond the proper limit, and seriously interfere with the discussions which are so important a part of our proceedings. We have already experienced the disadvantage of an overcrowded programme, and I trust that the next Committee on Annual Meeting will rigidly enforce the presentation of short papers, condensed and abstracted, so that only the kernel shall be given to us, and in such form that time will be given for each Fellow to clearly and succinctly express his opinion, if he so desires.

We are placing on trial this year a new plan: the furnishing of proofs in advance of some of the papers to be presented. The committee believe that this method if properly carried out will be a valuable advance, and trust that all of you will be so satisfied with the result of the experiment that the practice will next year become a general one. With the paper in full already in the hands of the Fellows, the essayist will require but a short time in which to present the principal points of his paper, and time for discussion will be greatly increased.

One word in regard to our TRANSACTIONS: it is impossible for the Committee on Publication and our hard-worked Recorder to issue such a volume promptly, as we all agree it should be, unless the Fellows at the time of the meeting have their papers fully completed and presented in duplicate, so that if published in a journal there need be no delay in putting them in type. A single tardy Fellow often delays the publication for months. In justice to the Association, we have a right to expect that this practice shall not be continued in the future.

Our volumes of TRANSACTIONS have usually been most valuable and are highly prized. The total number of articles published up to last year was 435, contributed by 132 Fellows. The papers cover the entire surgical field, but, as might be expected, the internal organs are the ones most frequently considered. Geographically, authors represent every section from the Atlantic to the Pacific, and from Maine to Louisiana.

At the time of the organization of this Association one of its founders said to me: "In my opinion, surgery has nearly reached its limits; I do not see how it can advance much beyond its present height of perfection." Looking back over the twenty-one years, we can see to-day how surgery has been almost revolutionized since that time, yet we may confidently hope that at the end of a similar period of time our successors will look upon our work of the present day as being equally crude and imperfect. My prediction is that another quarter of a century will find surgery upon a vastly higher plane, and that carcinoma, sarcoma, tuberculosis, and many other conditions upon which we now look with dread will be transferred to the list of curable diseases. Toward the attainment of this desirable object every Fellow of this Association should lend his aid and put forth his best endeavors, realizing that if a single individual omits to insert his small contribution in the edifice of scientific surgery, the progressing structure will be either retarded or rendered imperfect.

We have now attained the age of strong manhood, and should show to the world that American surgery stands not only for careful diagnosis, scientific investigation, and skilful technique,

but also for honesty of purpose and high moral and Christian standards of individual character; that the high aim of the profession in this country is not self-aggrandizement nor the acquisition of wealth, but the advancement of science, the benefit of humanity, and the broadening and upbuilding of all that is most noble in our profession.

A CASE OF PERFORATING GUNSHOT WOUND OF THE STOMACH AND LIVER, WITH POSTERIOR THROUGH DRAINAGE, AND RECOVERY.

By ROSWELL PARK, M.D.,
BUFFALO.

About 6 P.M., February 3, 1902, a woman, aged twenty-six years, turned the point of a 22-calibre pistol toward the centre of her body, and fired it in a suicidal attempt. She was soon afterward removed to the Buffalo General Hospital, where I saw her about 7.30 P.M. But one shot had been fired. This evidently took effect in the middle line, about an inch above the tip of the sternum. Between the time of the injury and when I saw her she had vomited more or less fluid and bloody material. With the exception of complaint of considerable pain and the vomiting as above, her general condition was good. I at once prepared her for operation, and had the back of the body as well as the anterior surface scrubbed and sterilized.

Gas and ether were given as the anæsthetic. The area of the gunshot wound was excised by a wide elliptical incision, which was then extended downward as a straight-line incision to the region of the umbilicus. The xiphoid appendix was not only perforated by the injury, but broken loose from its attachment, although not so loosely that its removal was called for. Upon opening into the upper abdomen a large quantity of fluid and clotted blood presented, and was removed with the hand used as a scoop. Upon withdrawing the stomach it was evident that the bullet, which had passed through the left lobe of the liver, had cut across the upper curvature a little to the pyloric side of the middle of the curved line. This opening was like a notch in the upper border, which probably had been a double perforation at first, with a very slight intervening bridge, which latter was torn in the handling of the viscus. Through it the little finger could be easily passed into the stomach. The stomach seemed rea-

sonably empty. I made no particular effort to clean it out, but at once carefully closed the opening with three rows of fine silk sutures, the first of which closed the mucosa, and the last of which took in some of the peritoneal fat, making a sort of omental graft. After replacing the stomach it was evident that there had been considerable more hemorrhage from the bullet track in the liver. I again removed a large amount of blood from the lesser peritoneal cavity, at first with the hand and later by sponging. Altogether at least two quarts of fluid and clotted blood was thus removed.

Of the bullet I found no further trace. Exploring backward through the gastro-hepatic omentum I could not make out any wound or injury of the pancreas. Nevertheless, I made a posterior opening on the left side at the costo-spinal angle, and here cut down upon the point with a long pair of forceps introduced through the front and held in the left hand. Through this opening a good-sized drainage-tube was drawn with the forceps, being drawn from without inward to a depth of about six inches from the skin, so that its inner end lay in the cavity of the lesser omentum in front of the pancreas.

This still left a somewhat gaping punctured wound of the liver, the hemorrhage from which was easily checked by tamponing with a strip of gauze. This strip was left hanging out of the upper end of the abdominal wound. Before closing this wound, and before making the final toilet of the peritoneum, I inserted a large gauze drain wrapped in perforated oil-silk, which was passed through the gastro-hepatic omentum to such a depth that its lower end was close to the inner end of the posterior drainage-tube. The abdominal wound was then closed with silkworm sutures, save for the point where the drain emerged, where secondary sutures were used.

The patient developed no unpleasant symptoms after the operation, save that on the following day her temperature was 102.5°. She was given two enemata, each of which contained two grains of antipyrine. She vomited no blood, and raised scarcely any fluid at all. After the second day her temperature never went above 100°. The anterior drain was removed on the third day, and the gauze tampon removed from the liver on the fifth. The posterior drain was shortened on the third day and removed on the fifth. Absolutely no fluid was allowed in her stomach for four days, and nothing except water until the eighth day, she being nourished meantime by the rectum. Abdominal sutures were removed on the fifteenth day. She left the hospital March 11, 1902, in apparently perfect health. I have not subjected her to X-ray examination for

the purpose of detecting the present location of the bullet, and consequently have no idea just where it may be located.

The important lesson of this case as most impressed upon my mind is the value of posterior drainage. Whether she would or would not have recovered without it, I cannot say, but I have felt that it was a most wise and successful procedure. Other lessons conveyed by it are not confined to this alone, and would suggest themselves in any similar case with similar or even with unfortunate outcome. Not the least of them is the lack of regard paid to the location of the bullet, which still remains unknown.

THE GREAT IMPORTANCE OF DRAINAGE IN BULLET WOUNDS OF INTRAPERITONEAL VISCERA.

By L. M. TIFFANY, M.D.,
BALTIMORE.

Bullet wounds of the peritoneal cavity implicating the alimentary canal, resulting from firearms of large calibre or projecting bullets of low velocity, such as fall to the care of surgeons in civil life, are necessarily infected wounds, infection which is not limited to the immediate wound itself; and while the infection may perhaps be so small as to be taken care of by the tissues involved and adjacent peritoneal membrane, yet such limitation of infection is not to be taken for granted by the surgeon, but the wound after closure of the visceral perforations should be drained. At present I am of the opinion that sterile gauze is the best material for drainage.

The hollow viscera within the belly contain more or less gas and any quantity of infecting material. They fill the peritoneal cavity accurately, adapting their shape, thanks to gas pressure, to it. The walls of the hollow viscera are thin compared with their lumina; their size and shape vary continually during life; changes are induced by peristalsis and the varying pressure of abdominal muscles, diaphragm, etc.

A honeycomb with irregularly-shaped cells, instead of the classical hexagons, suggests itself for comparison, honey being replaced by food more or less digested, according as one has to do with the upper or lower portions of the alimentary canal. It is probable that the interior of the alimentary canal from end

to end contains a wealth of infecting material—microbic, etc.—quite beyond calculation, which material may be taken as replacing the honey of the comb. The flora of the intestines is legion.

La Garde's experiments have taught us much about the infection of bullets, and we may accept that the track of a bullet after wounding the alimentary canal is necessarily an infected wound. At first the infection is confined to the intestinal walls and the wound beyond the peritoneal cavity, but so soon as the perforations no longer coapt, from peristalsis or other cause, then infection is disseminated by leakage usually, but even without leakage, from the fact that infected tissue is rubbed over adjacent peritoneum. It is likely that spasm of the muscular wall of an intestine or stomach follows the bullet injury, inducing quiet for a certain time, after which motion and leakage are to be expected. We have absolutely nothing to show how soon after a bullet wound is received leakage is to be expected and general infection commence, but there is no doubt about the fact that there is direct relation between the period after wounding and the amount of constitutional infection present, the two going hand-in-hand. Abdominal section has shown that the sooner the section is done the less is the peritoneal inflammation, both in extent and intensity. Infection is something beyond macroscopic examination. General washing by normal salt solution of the peritoneal cavity is permissible only when very extensive, when what is called general suppuration exists. In such cases flushing with many gallons of normal salt solution is to be supplemented by free openings with drainage in each loin, above the pubes, to the outer edge of each rectus abdominis, and elsewhere, as may seem necessary. Very rarely after gunshot wounds does this condition of affairs obtain. Under other circumstances, where purulent inflammation is not present or is not very extensive, washing by means of normal salt solution is unwise and uncalled for, since by means of such washing infection may be carried to clean portions of the peritoneum and disseminated through healthy areas. By the use of sterile gauze, dry or dipped in normal salt solution, and squeezed strongly, the areas

exposed to infection can be thoroughly wiped and the whole peritoneal cavity dried. It is not necessary to always eviscerate the patient, but each flank, and especially the pelvis, needs careful attention. A large strand of gauze is then to be carried to the bottom of the pelvis or along the course of the bullet, or both, according as the operator deems expedient, and normal salt solution in large quantity is injected into the patient's subcutaneous tissue, and likewise a large enema should be given before the patient leaves the table. One of the bullet wounds can be utilized, before suturing, to fill the bowel with salt solution, but care must be taken that no wound exists in the bowel lower down, otherwise feces will be washed into the belly. The object desired is to fill the patient's vessels, to overfill them, with salt solution, and make free transudation into the dry peritoneal cavity possible, from which the gauze will remove it, thus causing the peritoneum to clean itself and drain away from, rather than absorb into, the body. Washing the peritoneum from within outward, rather than washing the cavity itself by pouring salt solution into it, is the better way, I think.

Fluid by mouth is to be withheld; salt solution enemata are to be given every four hours, and subcutaneous infusion if expedient; free outflow of the gauze from the peritoneal cavity is a very favorable symptom, and the sooner it appears the better for the patient. So important do I believe this symptom to be that unless a patient suffers from constitutional sepsis when free drainage appears, I feel justified in holding a favorable opinion as to the ultimate outcome of the injury. The drainage ropes are not to be moved for several days, but the voluminous dressing resting on the skin can be changed when necessary.

Placing a gauze drain to the bottom of the pelvis is necessary only in extensive infections. It is usually sufficient to lay gauze along the course of the bullet after freely wiping and cleaning the peritoneal cavity.

Case I. *Bullet wound of liver, stomach, and probably lung; abdominal section, suture of visceral wounds, gauze drainage; recovery.*—C. F., white male, aged thirty-nine years, admitted to University Hospital

April 7, 1895, shortly after being shot. The shooting was said to have occurred about 12.30 A.M. The bullet entered the right hypochondriac region, three inches from the middle line, two inches below the margin of the rib cartilage. Percussion showed dulness in the right flank. At 3 A.M. I opened the abdomen by a vertical incision, six inches long, passing from the margin of the rib downward through the bullet wound. The right abdomen contained much blood and clot; the bullet had passed through the right lobe of the liver and through the stomach (two holes), and then to the left without wounding any other abdominal viscus. The stomach wounds were sutured, the liver wounds packed with gauze, the general peritoneal cavity washed out, and the gauze from the liver utilized for drainage. All went well at first, the gauze draining the bile; then inflammation developed in the chest, and the patient expectorated bile-stained pus. The bullet had probably passed into the chest. Bile was discharged in large quantities through the drainage apertures, but ultimately complete recovery followed. Patient discharged June 19. Silk used for sutures.

CASE II.—A. L., aged forty-three years, mulatto, female, entered hospital March 13, 1902. The patient was admitted to the hospital at 5.30 P.M., having received a bullet wound of the abdomen. The bullet wound was situated two inches below and one inch to the right of the umbilicus. The bullet was believed to have been fired immediately in front of the patient. I opened the abdomen about three hours after the receipt of the injury, by an eight-inch incision parallel to the linea alba, passing through the bullet wound. The small intestine was wounded in nine places, the mesentery in one, and one perforation of the posterior wall of the peritoneum where the bullet passed into the back. (I neglected the perforation of the peritoneum where adherent to the interior abdominal wall.) The bullet was not sought for.

The patient was treated in the way advised in this paper. A drain of gauze was laid along the course of the bullet, and the wound closed with interrupted silver through and through. The drain was removed March 20th. During the operation the patient received 1500 c.c. normal salt solution by infusion, and afterward 1000 c.c. of same by enema every six hours. The lips were moistened with cold water occasionally. Time consumed in operation, two hours and thirty-five minutes. At the close of operation, pulse, 96; respiration, 32. The patient abstained from water by the mouth for six days. The

bowels were moved by enema on the fourth day, and daily thereafter. Recovery was without notable incident, and the patient returned home April 12th.

I have reported these two cases together, with a view of comparing the treatment employed, the latter being the method which seems to offer the best outlook after a severe surgical injury.

THE RESULTS OF WOUNDS OF THE LARGE JOINTS BY MODERN MILITARY PROJECTILES.

By C. D. NANCREDE, M.D.,
ANN ARBOR.

The time has not yet come when any modern observer can give the exact percentages of recovery after conservatism, excision, or amputation for gunshot wounds of the greater articulations received during actual warfare. This is because sufficient data have not yet been collected and published of the Boer-British war to enable us to make such exact statements as those of our own Civil War, the Spanish-American war, and the Philippine casualties enable us to do. I shall not endeavor to present complete statistics giving the exact number injured by small or large-calibre balls, or shell fragments, because this would consume much time and no commensurate good would result. Nevertheless, an endeavor will be made to clearly indicate the general principles of treatment involved in the several different classes of gunshot wounds. Although in time more exact percentages may be obtainable, it is doubtful whether the figures will materially alter the statements warranted by the data already at our disposal. These I shall lay before you from the clinical rather than from the statistical side, for none of us will be likely in an individual case to be deterred from adopting a course which our experience indorses by a fractional per cent. greater risk shown by statistics. If the majority of such collections of cases show uniformly better results from one method of treatment, unquestionably we should be

influenced but not governed by such knowledge in determining the proper course to pursue in an individual case.

A study from the clinical rather than from the statistical side is all the more necessary when such statements as the following are still found in a modern text-book in use in most of our American medical schools. While I shall not quote verbatim, many of the sentences are word for word as there printed. It is asserted that it matters little whether a joint is traversed by a large ball or a fragment of a shell, or merely opened by a fissure extending from a wounded long bone, unless amputation or excision is primarily performed a suppurative arthritis will develop in from forty-eight to seventy-two hours, quickly proving fatal, although in some instances recovery may ensue after months of suffering with a crippled joint, or only after a secondary resection, more often an amputation.

Let us briefly state the data upon which such statements are founded, emphasizing the fact that they resulted from an exaltation of statistics over clinical observation, which even before 1898 showed conclusively that however true the conclusions possibly were for the period up to about 1876, they were becoming less reliable with every passing year. Unfortunately, the old views still decidedly tincture modern practice, hence my protest in the shape of this paper.

During the Civil War wounds of the shoulder-joint gave a mortality of 25.7 per cent. under conservative treatment, which was, of course, reserved for the slighter cases; after amputation, 29.1 per cent. died, while the combined mortality of primary, intermediary, and secondary resections was 35.43 per cent., that of the intermediary operation reaching the appalling figures, to the modern military surgeon, of 46 per cent.

The elbow-joint, considering its more superficial position and more favorable anatomical environment, shows not very much better results, the mortality, after expectant treatment, being 10.3 per cent.; after excision, 22.4 per cent.; amputation at the lower third of the arm having a mortality af 20 per cent. The aggregate mortality after all methods of treatment was 19 per cent. By expectant treatment the death-rate for wrist-joint

wounds was 7.6 per cent., while with all other methods combined the mortality was 25.90 per cent.

From the same source the figures show that conservatism in gunshot wounds of the hip-joint practically meant death, the mortality being given as 98.8 per cent. The combined death-rate of the primary, intermediary, and secondary excisions gave somewhat better results, 85.5 per cent. only perishing, while the secondary excisions enable one to give a sigh of relief when we find that only 63.4 per cent. died. The results of amputation at all periods were about the same as for excisions, viz.: 89 9 per cent., this apparently good showing, however, being due to a not inconsiderable number of re-amputations of stumps, since the secondary amputations gave a much higher death-rate (82.5 per cent.) than do secondary excisions (63.4 per cent.). The results of the Franco-Prussian war are not really much more encouraging, 31 out of 33 wounds of the hip perishing under conservative treatment (*i. e.*, 93.63 per cent.), 18 out of 20 excisions died (85.7 per cent.), while of the 11 subjected to amputation all perished (100 per cent.).

Of 432 cases observed during the Civil War, even where no lesions involving the bones constituting the knee-joint existed, 95 died (*i e.*, 21 9 per cent.). The ultimate results of 44 out of 54 excisions reported give a death-rate of 81.4 per cent., exceeding that of low amputations of the thigh, viz.: 53.8 per cent.

The Schleswig-Holstein war gave for excision a mortality of 86.6 per cent.; for those done during the Franco-Prussian war, 80 per cent.; while all died, 100 per cent., during the Russo-Turkish war of 1876–77.

Otis reports 133 resections collected from all sources, from civil life as well as military practice, with 35 recoveries, a mortality of 73.2 per cent. It would appear that conservatism even then gave a better showing than my text-book quotation would indicate. Although this treatment would doubtless be employed for the less severe cases, yet of 868 with bone lesions so treated, many of which were serious, only 521 resulted fatally, a death-rate of 60.6 per cent. According to Otis, of

512 wounds of the ankle-joint treated conservatively, 407 recovered and 99 died, a mortality of 19.5 per cent. Of 31 excisions where the results were finally determined, 22 recovered and 9 died, a mortality of 29 per cent.; finally, an average death-rate of 25.1 per cent. obtained for amputations performed at all periods. This formidable array of figures superficially scrutinized, warrants the pessimistic views quoted. In the light of modern science a more careful study, however, suggests a rather different conclusion as possible. Although it is true that conservatism was reserved for what were supposed to be the less severe injuries, with the exception of wounds of the hip, the results were so vastly superior to those secured by operation that one cannot but harbor the suspicion that some of the mortality was due to meddlesome surgery, and that a number of cases where primary operations were deemed requisite might have done as well as the slighter cases did, provided the surgeons had not infected the wounds, and free drainage had been secured by the same measures employed in the so-called conservative treatment—*i. e.*, removal of bone fragments after enlargement of the wound.

Before attempting to explain the differing results obtained by the old and new methods of treating gunshot wounds of the joints, let me give the clinical results secured during the past four years in the United States Army without going into unnecessary minutiæ. I have found reported 161 wounds of the shoulder, elbow, wrist, hip, knee, and ankle-joints, paralleling those quoted in the Civil War statistics. These may seem a small number, but when I state that so far as reported exactly similar results were obtained in South Africa, and when it is observed that serious operations were rare, that conservatism—chiefly antiseptic occlusion—and fixation were the rule, and that death after both operative and non-operative treatment was extremely rare, you cannot fail to recognize that my quotation is most pernicious doctrine, and one absolutely unsupported by modern clinical facts.

Six wounds of the hip-joint gave 5 recoveries and 1 death from infection after removal of bullet or fragments of jacket or bone.

Sixty-seven cases of knee-joint wounds are reported, but with 5 deaths at the date of publication; two fatal amputations for infection followed the removal of the bullet or some fragments, 10 cases in all only apparently demanding extraction of the bullet, or fragments of bone or shell. Twenty wounds of the shoulder-joint were followed by 2 deaths, 1 after amputation, and in a third case a successful extraction of the bullet was done. Of 25 wounds of the ankle-joint, 2 died after amputation, one operation being done for gangrene, and in 1 other case a bullet was successfully extracted. Thirty-five wounds of the elbow-joint gave but 1 death, one typical resection being requisite, the bullet, or ball, or bone fragments were removed in 4 more, and in 3 amputation became later necessary for infection, this almost certainly resulting from previous exploration or operative intervention. Nine wrist-joint wounds were treated without a death, and with only one operation, viz.: an amputation. No figures are needed to show exact percentages, and these would probably not be accurate, because subsequent deaths or operations may have followed alleged recoveries apparently secured when reported; nevertheless, 7 amputations for ball wounds of the knee, shoulder, ankle, and wrist-joints, one resection of the elbow, about a score of removals of bone fragments or bullets, wiring of fragments, etc., with an ascertained mortality of only 10 out of a total of 161 cases, speaks for itself. Lest I seem too optimistic, let me quote the experience of Mr. Makins in South Africa: "During the present campaign direct, clean wounds of the joints were little more to be dreaded than uncomplicated wounds of the soft parts alone. No more striking evidence of the aseptic nature of the wounds, and the harmless character of the projectile, as a possible infecting agent, than that offered by the general course of these injuries in this campaign, is to be found in the whole range of military surgery."

While there are doubtless other factors productive of these changed results, I think the chief ones are the following: First, the practice of many of the Civil War surgeons was unconsciously influenced by the mediæval notion that in some mys-

terious way gunshot wounds differed from others of the same class (*i. e.*, combined punctured and contused wounds), hence, something must be done, and, of course, something different from that which was indicated for similar wounds produced by other vulnerating bodies than bullets. Then, too, it was deemed most important to ascertain the exact extent of the damage, for unaided nature could not be trusted, but must be assisted by art. The gratification of this knowledge, of course, more often determined infection than relieved it, and the modern methods of drainage were unknown. Finally, the almost unbounded powers of repair possessed by the tissues, if left to themselves, has been a modern revelation. In other words, infection by the probe and fingers, additional traumatism still further diminishing the resistance of the tissues, no knowledge of how to successfully combat and render comparatively inert the results of infection, had more to do with the dangers of the older missiles than their form, composition, or the kind of destruction effected. Unquestionably because the old ball had a low velocity, was large in calibre and apt to become deformed, it tended to carry fragments of infected clothing, skin, etc., into the wound. Still further, its "energy" was so low that it frequently did not perforate the parts, the "energy" was diverted, and extensive devitalization of the tissues resulted, favoring infection, and the infected foreign body often remained lodged. This was bad enough when true, but often when the ball had done little or none of these things, the pernicious idea that the ball was in itself a menace to life and health, lead to the infection of joints which would otherwise have recovered; the modern gospel "that a bullet when it has ceased to move has usually ceased to be harmful," at least primarily, did not seem to be dreamt of.

The lessened morbidity of modern missiles is explainable, first, from their smooth, polished surface rendering them poor vehicles for germs in fact, the jacketed balls have been proven in most cases to be germ-free. Then from their small calibre and smooth surface they almost never carry in with them fragments of infected clothing or skin. Finally, because their

velocity is such that perforation is the rule, comparatively little of the "energy" is diverted, unless marked resistance is met with, which cancellous tissue does not present, and the area of devitalized tissue is therefore less than with the old missile, thus rendering infection less likely to occur, and when it does obtain, rendering it not so dangerous. The missile also comparatively rarely lodges.

In brief, the dangers to life, and in a great measure to function, of a wound of any joint is infection. In a certain number of instances, undoubtedly, the physical destruction of joint surfaces must cause restriction of function. Even with free comminution, however, the subsequent range of motion is often remarkable. Thickening of and adhesions between the soft parts, intracapsular or extracapsular changes, often does more harm in the way of limitation of movement than does physical alterations of the articular surfaces; and per contra, with the alteration of the joint surfaces such as occurs in closed fractures involving articulations, an eventually good functional result is the rule, if reduction is secured and maintained, unless unusual inflammation occurs. In this connection, it must be remembered that displacement of bone fragments by modern balls is very often slight, and that the cancellous extremities of the bones are often clearly perforated, or but slight fissuring occurs. If, then, we can avoid infection, an articulation may be damaged to any extent by a modern small-calibre military missile with impunity, so far as life is concerned, and despite free comminution in many instances, excellent functional results can be secured.

Treatment. I cannot do better than to preface my own advice as to treatment by quoting from Mr. Makins' experience of joint wounds, one who speaks from personal knowledge acquired, as my own is, both in civil and military practice: "The general treatment of the wounded joints was simple. The old difficulties on deciding on partial as against full excision or amputation were never met with by us. We merely had to do our first dressing with care, fix the joints for a short period and be careful to commence passive movement as soon as the

wounds were properly healed, to obtain in the great majority of cases perfect results." Speaking of the knee-joint he says: "The injuries to this joint gave less anxiety and attained a more favorable prognostic character than is the case in civil practice." With a probable or certainly perforating wound of a great joint, whether proven by the course pursued by the ball, bone dust at the wound of exit, palpation proving fracture, or the X-ray, or with a wound suspected to be a joint one on good anatomical grounds, the proper treatment is most carefully to avoid any examination of the track of the ball, and to thoroughly disinfect the neighboring parts by sterilized soap, nail-brush, alcohol, and chemical germicides. Of course, shaving the area surrounding the parts must be done. An abundant dry antiseptic or aseptic dressing, preferably the former, should be applied, and the joint adequately fixed *until the wound is healed.* Of course, few if any of these procedures can be carried out on the field, but antiseptic occlusion by the first-aid package can be done, and some measure of fixation can be secured by one of the makeshifts so familiar to the military surgeon. Where such complications as hemorrhages from contiguous vessels, the certain or extremely probable lodgement of infected objects, as fragments of clothing, etc., compel an exploration, after the most careful antiseptic preliminaries, the wound must be explored, the complications dealt with, and such completely, or almost completely, separated bone fragments as will necessarily perish if infection follows the intervention, and must then act both as foreign bodies and as obstacles to drainage should be removed, while all main attached fragments should be replaced, and either wired or sutured in position. Free drainage must be secured by gauze, preferably by tubes introduced through any required number of incisions into the joint, and fixation made, remembering the great risk to both life and function is pyogenic infection, which is extremely probable after exploration; and that the only efficient means we have to combat infection is, after the primary disinfection, to secure the promptest possible removal of all inflammatory secretions as soon as they are formed. It is almost of equal importance

to prevent all movements of the articulation which will mechanically diffuse the infection more widely. Movement also maintains and increases hyperæmia, which in turn impairs the nutrition, and, hence, the resistance of the tissues, thus often converting a local into a widespread infection. When the constituent articular ends of the bones composing a great joint during exploration are found so damaged as to apparently demand formal resection, especially in the case of the knee, and where, therefore, the dangers of infection are exceptionally great, amputation will usually prove the better practice. This only more strongly emphasizes the imperative duty of non-interference in wounded joints, unless complications such as hemorrhage or the lodgement of infected objects demand exploration, because it is almost impossible to secure an aseptic course for the wound when dealing with such large areas of partially devitalized tissues.

But supposing the ball is lodged in the joint? Even in such cases, if uninfected, risk to life is absent, and delay in removal of the missile, unless superficially tangible, will enable the damaged tissues to regain much of their resistance to infective organisms. The fact of its location within or without the joint can also be ascertained by the X-ray, sometimes preventing the performance of an operation on the incorrect diagnosis of an intra-articular missile. I would most earnestly beg surgeons in all cases of suspicious wounds *near* joints which *may* have opened the capsule to beware of primary exploration, even if the missile be lodged, to fix the joint until the wound heals. When this cannot be done, if possible, postpone the extraction of the extra-articular ball at least until the capsular wound has had time to close, otherwise slight, almost latent, deep-seated suppuration may lead to the most disastrous results.

When, however, infection has occurred, either from exploration or because of the lodgement of infected materials, what should be done? Unless the symptoms indicate that no delay is possible, when amputation is demanded, incision with free tube drainage and scrupulous disinfection should be tried, all loose bone fragments or those practically certain to necrose

being removed. This will usually succeed with the elbow, often with the shoulder, possibly with the ankle. It will prove the best treatment, I believe, for the hip. Doubtless a transverse incision in front of the knee, dividing the patella, with antiseptic packing of the joint after removal with knife, scissors, or curette of all possibly infected parts and loose bone fragments, will save a certain number of limbs and lives when infection occurs in cases with slight bone lesions, secondary suturing of the patella being done later. Secondary resection may become requisite for caries or necrosis of fragments. When the local and constitutional evidences of infection increase despite drainage, amputation remains the only resort and should not be delayed. In like manner secondary hemorrhage from a main vessel complicating an infected joint wound would indicate removal of the limb. I have spoken of "nearly certain lodgement of infected fragments of clothing" as a possible indication for exploration, a phrase which needs interpretation. While the majority of military wounds are inflicted by small-calibre jacketed balls, such as the Mauser, Lee-Metford, Krag, and similar weapons project, moving with great velocity, these balls may be deflected by ricochet, or be deformed before wounding, hence they are nearly as likely as the old bullets to carry in fragments of clothing, pieces of shoe leather or infected skin, especially that of the foot. The character of the external wound will often prove that the missile was deformed, or entered more or less sideways, hence has possibly inflicted an infected wound. Sometimes in such cases, even when examined comparatively soon after the injury, there are clear evidences of commencing infection. Again, soft lead pistol balls are still employed, and blunt-pointed Remington 45-calibre balls, Martini-Henry projectiles, together with the soft lead balls of shrapnel shell, may be the vulnerating bodies. All these possess a low velocity, some are apt to become deformed, all tend, when partially spent, if meeting with moderate resistance, to enter more or less sideways, hence are apt to carry in infected materials.

A CASE OF SEVERED SPINAL CORD IN WHICH MYELORRHAPHY WAS FOLLOWED BY PARTIAL RETURN OF FUNCTION.

By RICHARD H. HARTE, M.D.,

AND

FRANCIS T. STEWART, M.D.,

PHILADELPHIA.

It is unrefuted that several peripheral nerves may functionate after the ends have been approximated, but that regeneration of the central nervous system occurs is denied by practically all writers and investigators; and most of the few who do not deny, simply question. The reasons for this non-regeneration are not clear. Some theorize that it is due to the absence of the white substance of Schwann, through the agency of whose nuclei regeneration is accomplished,[1] while others hold that the axis-cylinders are secreted by the neurilemma cells which are not present in the cord;[2] it has been asserted that new nerve fibres are built by the connective-tissue cells, and it has been claimed that they are formed by the colorless blood corpuscles.[3] Fickler[4] believes that if the normal circulation of blood and lymph is restored the axis-cylinders may grow. If we accept the theory of the "central school," to which the overwhelming majority of observers belong and who teach that regeneration occurs by the outgrowth of the old axons of the central stump of a divided nerve, there is no apparent obstacle to regeneration of the fibres composing the spinal cord.

Voit[5] obtained a regeneration and partial return of function after ablating the cerebral hemispheres of a pigeon. Vitzou,[6] as the result of experimental research, concludes that there may

be an actual new formation of nerve cells in the brain, and that restitution of any of the functions after removing the hemispheres is due to such regeneration; and Tedeschi[7] asserts that he has demonstrated the possibility of a regeneration of the nerve cells.

Müller[8] amputated the tails of lizards and tritons, and proved that regeneration, both anatomical and physiological, may occur in the new tail. Masius and Vanlair[9] excised sections of the spinal cord in the frog; motility and sensibility were restored, and nerve cells and fibres were demonstrated in the cicatrix.

Brown-Séquard[10] observed a return of function after dividing the cord in doves and guinea-pigs, complete return in the former, partial in the latter.

Dentan[11] obtained a partial return of function after cutting the cord in dogs. Eichhorst and Naunyn[12] experimented upon very young dogs by cutting or crushing the lower dorsal cord. Voluntary movements, together with sensation, occurred, and a limited number of nerve fibres were found in the tissue between the ends of the cord. Schmaus-Sacki[13] observed young fibres scantily distributed at the periphery of the cord in certain cases of experimental section of the cord.

Stroebe,[14] as the result of experiments on rabbits, found that the axis-cylinders of the dorsal roots that were crushed at the level of the cord injury made an attempt to pierce the cicatricial tissue in the cord. Kahler[15] crushed the posterior roots of the sixth and seventh lumbar and first and second sacral nerves in dogs. After several months a squeeze of the toes seemed to cause pain. As the result of experiments conducted on the second cervical nerve of the dog, Baer, Dawson, and Marshall[16] conclude that, after severance of the fibres of the dorsal root of the spinal nerves between the ganglion and cord, regeneration of the fibres into the cord will take place under proper conditions, so that normal reflexes through the respiratory, cardiac, and vasomotor centres may be obtained, and that if the posterior root fibres can thus be regenerated in the posterior columns of the cord, there seems reason to hope that the fibres in the other tracts may possess the same property, and that, therefore, it is not impossible that with proper technique a severed spinal cord

might be made to regenerate its broken tracts both ascending and descending. Dawson and Riggins[17] cut the spinal cord of a dog with a sharp knife at the level of the lowest dorsal segment and allowed the dog to live 112 days. The authors report that there was never any conclusive evidence of conscious sensation or of voluntary motion in the hind dog. "Regarding motion (these observations apply to the period just before the death of the animal), if the animal were placed on all-fours it would stand just like a normal animal. If the front dog began to walk, the hind dog would follow, flexing and extending one leg and then the other. There was no co-ordination between the movements of the front and hind legs, any irregularity in the movement of the front dog throwing the hind dog quite off its balance. As long as it was pulled forward slowly and steadily, the hind dog would walk. This is what I regard as a reflex."[18]

From the standpoint of workers among human beings one positive clinical case neutralizes many negative neuropathological investigations and cancels innumerable physiological experiments on animals. Thus far no satisfactory clinical case has been reported in which return of function has followed a total transverse division of the spinal cord in man, although the following cases cited by Lidell[19] are highly presumptive of such an event subsequent to partial lesions. Peniston[20] relates a case of stab wound between the eleventh and twelfth dorsal vertebræ which was attended by paralysis of the right leg. The patient was able to walk with the aid of a cane at the end of eight months. Vigues[21] reports a stab wound between the ninth and tenth dorsal vertebræ which was followed by paraplegia, retention of urine and feces, and bed-sores. Voluntary motion returned at the end of two months, and the patient was able to walk with the aid of a cane at the expiration of four months. Morgagni[22] records a stab wound of the neck accompanied by abolition of motion and sensation below the injured segment. At the end of forty days sensation and motion were present, but the patient was not able to walk for four months. Hurd[23] narrates a case of chisel wound of the lower dorsal region which was followed by immediate loss of sensation and motion below

the wounded part. The patient recovered sensation and imperfect use of his limbs. Meryon[24] publishes a case of stab wound between the tenth and eleventh dorsal vertebræ which caused a paralysis of the right leg. Complete recovery took place.

Robson[25] reports a case in which he implanted two inches of a rabbit's spinal cord between the proximal and distal segments of a severed median nerve. Sensation began to appear in the median area eight days later.

Fickler[4] has published two cases of compression of the spinal cord from caries of the vertebræ, in which he found a number of delicate, well-constructed fibres emerging above the point of compression and entering the cord below. As no such fibres occur normally at these points, and as one case had showed marked improvement in symptoms after the affection had persisted a certain length of time, he accepted them as newly formed axons and as evidence of the regenerative power of the spinal cord. Bielschowsky[26] has recently reported a similar discovery in a case of compression of the spinal cord, but he concluded that the fibres in his case were a split-off portion of the pyramidal tract, that the fibres observed by Fickler must have been of the same nature, and that the spinal cord cannot regenerate. Dercum and Spiller[27] claim to have shown that such fibres may be present in the spinal pia when there is no reason for believing that they are regenerate axis-cylinders, Fickler, however, states that such fibres have never been discovered except at the compressed point.

It seems to us that the course of many surgical spinal lesions strongly suggests the probability of regeneration of the axons of the cord. Certain it is that any considerable compression must destroy numberless axis-cylinders either as the result of the compression itself or of the ensuing myelitis, and it is equally certain that many of these cases fully recover. Schiff[28] attempts to explain this by stating that the intact portion of the cord, in partial lesions, assumes the functions of the destroyed portion, a "functional reparation" of the lesion. But there are cases in which every indication points to a complete crush of the cord and in which recovery ensues. These cases are regarded by

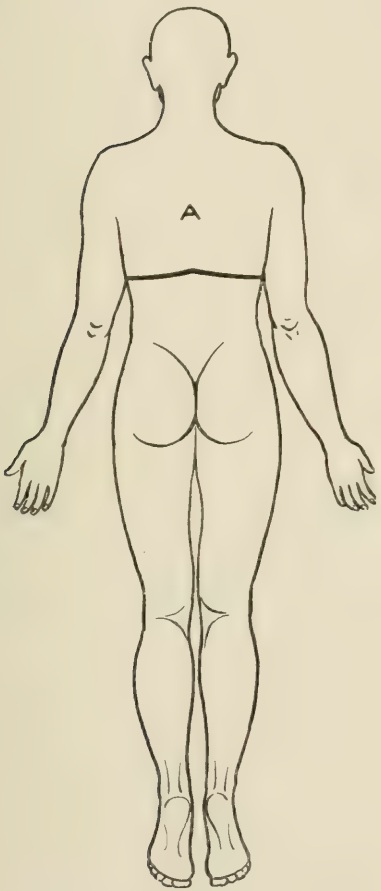
some neurologists as only partial lesions, their belief being that it is frequently impossible to diagnosticate a total transverse destruction of the cord unless the paralyses, etc., persist. If sensation and motion return, the question of regeneration is never even thought of, but this return is considered as conclusive evidence that the axons were not cut or crushed.

We submit the following case, which we believe to be the first myelorrhaphy performed in man, as evidence of the power of the spinal axons to regenerate:

C. N , aged twenty-six years, white, waitress, was admitted to Pennsylvania Hospital January 21, 1901, having been shot twice with a 32 calibre revolver. At the time of the accident the pain of a bullet was felt, then a mighty contraction of the lower extremities, and finally a sensation as if the lower portion of the body had been lost. Consciousness was retained. One ball entered about one inch to the right of the seventh dorsal spine and passed directly into the spinal canal; the other lodged beneath the skin in the right lumbar region, and was easily removed through the wound of entrance. There was immediate and complete abolition of motion and sensation below a line transecting the lower part of the tenth dorsal spine and a point three and one-quarter inches above the umbilicus, the distance between the ensiform and the umbilicus being five inches. This line of demarcation was sharply defined, and was superimposed by a belt of hyperæsthesia reaching as high as the ensiform cartilage. Just before operation this layer of hyperæsthesia also became anæsthetic. The superficial and deep reflexes of the lower limbs could not be elicited. The temperature was 97.6°, the pulse 120 and fair in volume, and the mind was clear. Three hours after the accident the patient was etherized and an incision about five inches long made over the dorsal spines, with the eighth dorsal spine for its centre. After dissecting back the muscles on either side the right lamina of the seventh dorsal vertebra was found to be crushed in, and the left lamina of the same vertebra fractured at its base. With the aid of forceps the spines and laminæ of the seventh and eighth dorsal vertebræ were removed, and the rent in the membranes, through which could be seen the bullet and a number of small fragments of bone lying between the ends of the severed spinal cord, was exposed. After removing the bullet, the fragments of bone, and the lacerated nervous tissue, the distance be-

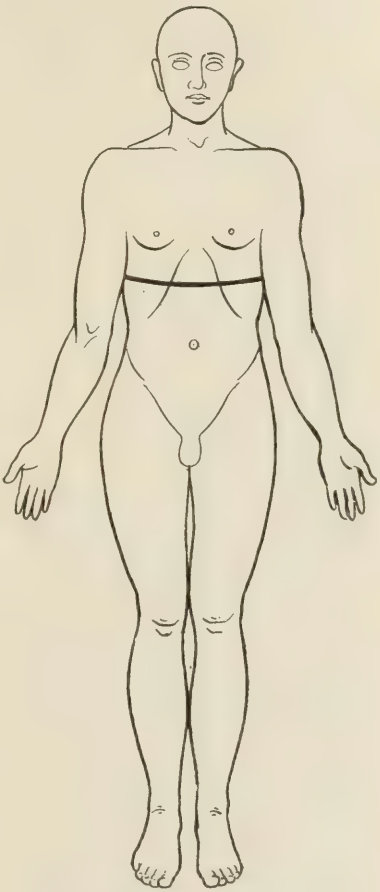
tween the segments of the cord was three-fourths of an inch. This statement was verified by the assistants, Drs. Mitchell and Van Meter, by the etherizer, Dr. Fraley, and by Dr. Newlin, who was watching the

FIG. 1.



Heavy line showing limit of anæsthesia before operation.
A. Level of injury to cord.

FIG. 2.



Heavy line showing limit of anæsthesia before operation.

operation. The wound was flushed with salt solution and the ends of the cord approximated with three chromicized catgut sutures passed by means of a small staphylorrhaphy needle, one suture being passed

antero-posteriorly through the entire thickness of the cord and the other two being passed transversely. This part of the operation was attended with unusual difficulties because of the narrow space in which the suturing was conducted, because of the consistency of the cord, and because of the wide interval between the fragments, the catgut frequently tearing out before the ends were finally brought together. The dura mater could not be approximated. A small gauze drain, which was allowed to remain twenty-four hours, was carried down to the cord because of the oozing, the muscles were united with deep sutures of catgut, and the skin closed with silkworm-gut. The patient was in better condition after than before the operation. During the first twenty-four hours after operation there was sharp pain over the front of the chest and in the vicinity of the wound. The patient complained of nausea, but could not vomit.

Fifth day: Complained of pain in the right knee, of thrills travelling up and down the extremities, and of cramps in the legs. Can feel a squeeze of the calf as a pulling sensation in the back. The surface is anæsthetic to one-half an inch below the costal margin on the right side anteriorly and to the ribs on the left. Posteriorly the anæsthesia ceases at the level of the iliac crest on the right, and on the left at the twelfth rib. There is retention of urine and incontinence of feces.

Seventh day: Hard pressure on the anterior crural nerve is felt in the mid-dorsal region, but elicits no reflex muscular contraction. Pin prick of the soles of the feet is felt in the mid-back and is followed by a feeble contraction of the leg muscles. The wound in the back has closed without mishap, and the stitches are removed.

Fourteenth day: Flexion of the foot is recognized as such and followed by a powerful leg contraction. Pulling the large toe toward the trunk felt in the ankle. Has "gooseflesh" on exposure to cold. Feels deep pressure over limbs and abdomen.

Twenty-first day: Urine in the bladder felt, but cannot be voided. Feels pin prick as far as the umbilicus and behind as far as the sacrum, but cannot localize it. Patellar reflex detected for the first time.

Thirtieth day: The urine now dribbles constantly from the bladder, and contains a small quantity of pus.

Thirty-fourth day: Complains of pain in the right heel, on which a smaller blister has developed. There are involuntary contractions of the legs spontaneous in origin. Pin prick, followed by a reflex contraction of the muscles, can be felt as low as the pubes and Poupart's ligament in front and posteriorly over the sacrum.

Forty-second day: Pin point felt several inches below the iliac crests on each thigh; massage distinctly felt over the legs. Can voluntarily extend the right big toe, and also the left leg slightly. Can tell when the bowels are going to move, but has no control over them.

Sixtieth day: Is out of bed in a wheeling-chair; moves the right big toe quite readily, and with great effort can feebly flex the knees. Pus has disappeared from the urine.

Third month: The knee-jerks are reinforced by strongly contracting the muscles of the arms and making a grimace.

Fourth month: The patient has received a superficial burn of the lower abdomen. This healed quickly and without reaction.

Fifth month: Patient is able to slide out of bed into her chair without aid.

Sixth month: During the absence of her nurse patient made an effort to stand and fell on the floor, causing a hæmatoma to form in the lower lumbar region. The skin did not break, however, and the blood was gradually absorbed. Sensation has become more acute and motion better.

Seventh month: Menses, which have been absent since the accident, have returned. There is no accompanying pain or discomfort.

Eighth month: Used bedpan and urinal for the first time; is able to stand, supporting herself between the bed and a chair.

Ninth month: Can feel floor under feet and appreciates dependent position of feet. Controls bowels except when the feces are liquid, and rarely soils herself with urine.

Tenth month: Menses are now preceded by severe pains in the legs and cramps in the lower abdomen.

Eleventh month: Has had a bilious attack, vomiting associated with retching, but accomplished without great effort.

Twelfth month: While sliding out of bed right leg became twisted and the right patella dislocated outward. There was intense pain in the right knee for twenty-four hours.

Fourteenth month: Patient takes a tub bath; can feel the water on the lower extremities and can distinguish between the water from the hot and cold spigots.

Sixteenth month (May, 1902): The general health is, as it always has been, excellent. The patient voluntarily flexes the toes, flexes and extends the legs, flexes and extends the thighs, and rotates the thighs. While sitting the extended leg can be raised from the floor. Flexion is more powerful than extension, and any movement is increased by

strongly contracting the muscles of the upper extremities at the time of making an effort to move the lower extremities. The patient slides out of bed into her chair by her own efforts, and is able to stand with either hand on the back of a chair, thus supporting much of the weight of the body. The bowels move every second day and are under perfect control, excepting the presence of diarrhœa. About one pint of urine is passed three times during the twenty-four hours. There is sometimes incontinence during sleep. The menses are regular, preceded by sharp pains in the lower limbs and accompanied by cramps in the lower abdomen. The patient has the sense of touch, temperature, pain, and position all over. The difference between heat and cold is not satisfactorily elicited when small test-tubes filled with hot and cold water are used. The best results are obtained with a hot-water bag and a large piece of ice. When a greater area is thus covered the patient is invariably able not only to distinguish the heat and cold when applied separately, but also when the ice is placed on one leg at the same time the hot-water bag is placed on the other, one leg feeling cold and the other hot. A pin prick can be localized as low as a line running transversely through a point two and one-half inches below the umbilicus. A pin prick can be differentiated from several pin pricks, and the pin pricks from a sharp blow from a pencil as far as the knee, but the localization of these sensations is not accurate. The muscles are moderately rigid, and there is present on both sides marked but easily exhausted ankle and patellar clonus. The deep reflexes elicited by tapping the tendo Achillis, the ligamentum patellæ, and the hamstring tendons, are marked, and may be reinforced by muscular exertion of the face and arms and by painful sensations, such as a sharp pinch in the arms. On tickling the sole of the foot the big toe flexes, the little toe abducts, and there is a feeble contraction of the tibialis anticus, the hamstring muscles, and the tensor vaginæ femoris. The rectus abdominis reflex is seen on both sides of the abdomen. There are no reactions of degeneration and no trophic changes in the skin or nails. The temperature has always been below 100°, except on the fifth day after operation, when the thermometer registered 101°. Although the patient has been bruised and burned, no bed-sores have ever developed. What has been accomplished in the post-operative course of this case must be credited entirely to the hopefulness, cheerfulness, and fortitude of the patient and to the diligence and devotion of the nurses of the Pennsylvania Hospital.

We operated upon the above case with a sincere belief that all cases of fractured spine should be treated as are cases of fractured skull. If there be symptoms, immediate operation is imperative. One would not hesitate to operate on a case of fractured cranium with paresis or paralysis, even though we know that the condition may be due to concussion and be transient, yet we are advised in cases of fractured vertebræ to wait until it be demonstrated whether or not the symptoms are really due to pressure or to concussion of the cord. When the cord is divided or crushed the maxim of spinal surgery is "no interference;" but who can say that the cord is divided without inspecting it? Abolition of motion, sensation, and reflexes is no sure guide, and if the cord be exposed and found severed, why not suture it? No harm can be done, and much good may result. It has been suggested that the nerve supply might be carried around the destroyed area by utilizing the posterior roots, but no success has followed the experiment.[29]

The operation of myelorrhaphy will be specially indicated in cases in which the cord has been cut by a sharp instrument or severed by a projectile. In cases in which the cord is crushed we have, at present, no infallible method of determining whether or not all the tracts have been destroyed.

While the distance between the ends of the severed cord in our case was three-quarters of an inch and the apposition was extremely difficult, we have been able to hold the segments of the cord in place after excising one inch in the cadaver. Guidone[30] conducted a series of experiments on animals and demonstrated that the spinal cord might be sutured after one centimetre had been resected. The results concerning the return of function were unsatisfactory.

The axiom of spinal surgery is "that compression, and compression only without injury to the cord, can be benefited by operation," but sufficient compression to produce anæsthesia or paralysis must be accompanied by the cutting, crushing, or tearing of thousands of axis-cylinders, and if axis-cylinders once injured never recover, the removal of pressure or of a spicule of bone sticking into the cord can do no good, and all operations

are contraindicated except to control hemorrhage or combat sepsis.

REFERENCES.

1. Bethe. Abstract in Centralblatt f. Nervenheilkunde und Psychiatrie, July, 1901, 449; cited by Spiller, Philadelphia Medical Journal, December 14, 1901, and others.
2. Ballance and Stewart. The Healing of Nerves, Macmillan Co., 1901,
3. Tillmann's Surgery, 1901, p. 490.
4. Fickler. Neurologisches Centralblatt, August 16, 1901.
5. Sitzb. d. königl. bayr. Akad. d. Wissensch., 1868, vol. ii. pp. 105-108.
6. Vitzou. Compt. rend. Soc. biol., September 16, 1895.
7. Tedeschi. Vorl. Mitth. Centralbl. f. allg. Path. u. path. Anat., 1896. vol. vii. s. 449-451.
8. Müller. Abhandl. d. Senckenbergischen naturforschenden Gessellschaft, 1864-65, vol. v. 113-136.
9. Masius und Vanlair. Centralbl. f. d. med. Wissensch., 1869, pp. 609, 610.
10. Brown-Séquard. Gaz. méd. de Paris, 1849, vol. iv. p. 232; also 1850, vol. v. p. 250; also 1851, vol. vi. p. 477.
11. Dentan. Inaug. Dissert., Berne, 1873.
12. Eichhorst und Naunyn. Arch. f. Exper. Path. u. Pharmakol., 1874, vol. ii. p. 225.
13. Schmaus-Sacki. Pathologische Anatomie des Rückenmarks, 1901, p. 378.
14. Stroebe. Ziegler's Beiträge, 1894, vol. xv. p. 383.
15. Kahler. Prager med. Wochenschr., 1884, pp. 301, 325, 333.
16. Baer, Dawson, and Marshall. Journal of Experimental Medicine, 1899, vol. iv., No. 1.
17. Dawson and Riggins. Amer. Jour. Phys., March, 1902.
18. Personal communications from Dr. P. M. Dawson.
19. Lidell. Inter. Ency. Surg., vol. iv. pp. 393, 394.
20. Peniston. New Orleans Medical and Surgical Journal, 1851.
21. Vigues. Moniteur des Hopitaux, September, 1855, p. 838.
22. Morgagni. De Sedibus et Causis Morborum: Brown-Séquard, pp. 103, 104.
23. Hurd. New York Journal of Medicine, 1845.
24. Meryon. Researches on the Various Forms of Paralysis, London, 1864, p. 69.
25. Robson. British Medical Journal, 1890, vol. ii. p. 624.
26. Bielschowsky. Neurologisches Centralblatt, April 16, 1901.
27. Dercum and Spiller. Revue Neurologiques, March 15, 1901.
28. Schiff. Centralbl. f. d. med. Wissensch., 1872, No. 49.
29. Lloyd. Philadelphia Medical Journal, February 8, 1902, p. 290.
30. Guidone. L'arte med., Mailand, Valiardi, 1900, vol. ii. Nos. 9 and 10; abstract in Centralblatt f. Chirurgie, March 30, 1901, p. 362.

DISCUSSION ON PAPERS OF DRS. PARK, TIFFANY, NANCREDE, AND HARTE.

Dr. Wm. L. Rodman, of Philadelphia.

I have been very much interested in all of these papers, and agree so fully with the positions taken by Drs. Park and Tiffany that there is very little for me to say other than to emphasize what they have already said. Dr. Park spoke of his patient vomiting blood, which is very usual in wounds of the stomach. It has very generally been taught that hæmatemesis indicated a perforating wound of the stomach, and should be looked upon as pathognomonic of such a lesion. According to Makins, this is not the case, and he reports instances in his book on the South African campaign showing that a non-perforating bullet wound of the stomach may cause hæmatemesis. The concussion may be enough to cause bleeding. The same is true in wounds of the chest, as hæmoptysis may follow a non-penetrating wound of the thorax. I agree with Dr. Park that all gunshot wounds of such a character should be drained, as the pistol ball which we now see in civil practice is either primarily septic or is apt to become so secondarily by carrying in particles of clothing, such as a piece of trousers, which I once removed. If it perforates a hollow viscus it certainly becomes septic, and in the majority of instances, practically always, drainage should be made. I can very well understand how a wound made by a small bullet, 22-calibre, for instance, where there had been no visible extravasation primarily, would permit of recovery without drainage; because we know that the impact of the ball is to cause intestinal paresis, ectropion of the mucous membrane, or both. Each tends to prevent fecal extravasation. I believe that extravasation always occurs. But the question is, *when?* There may not be great primary soiling of the peritoneum, but it is safer to assume that we have a septic wound, and, therefore, drain. Drainage should *always* be made after three or four hours have elapsed. Intestinal paresis and ectropion of the mucous membrane *may* prevent extravasation for a time, but, sooner or later, it must occur. In wounds of the stomach, posterior drainage should be made of the lesser peritoneal cavity. I am inclined to coincide with Dr. Tiffany as to the way in which

drainage should be made; as a general rule, it should be made with gauze, although I have generally used tube drainage as well. If there has not been much apparent soiling of the peritoneum it is better to simply wipe around the opening made by the bullet, and not irrigate; but if there has been much peritoneal involvement, then it seems to me a better practice to irrigate very copiously. As to the other question, whether or not the bullet should be looked for, I take it that there are very few members of this body who will consider time well spent in looking for a bullet in the abdomen. A bullet which has ceased to move is unlikely to do further injury. We all recognize, furthermore, that good results in these operations are directly proportionate to the length of time that patients are on the table. It is out of the question to spend much time in looking for a bullet. I have known one to be washed out by copious flushing. If it has gone into the muscles of the back it is in a perfectly safe place. When seen it should certainly be removed, but not made the object of prolonged search. Those who advocate an opposite course might with profit recall the statement of Dr. Abernethy to his students in his lecture upon lodged missiles: Sir Ralph Abercrombie received a bullet in his thigh; the surgeons groped, then groped, and then groped, and Sir Ralph Abercrombie died.

Dr. N. B. Carson, of St. Louis.

So much has been said in regard to the drainage and care of abdominal wounds that there is very little left for me to add.

In reference to the question of flushing, I would say that I am opposed to it, as my experience with it has been very unsatisfactory, not one case that I so treated having terminated successfully. Where I have used the sponges or the wiping out of the cavity, as recommended by Dr. Tiffany, I have had better results, and I think this treatment promises more than the flushing method.

In cases of gunshot wounds of the intestines where some time has elapsed after the receipt of the injury, I am decidedly in favor of lumbar drainage, and I think that in all gunshot or incised wounds of the intestine that we would have better results if, after wiping the cavity out thoroughly, we would drain posteriorly as well as anteriorly.

Dr. Nancrede. I am not anxious to force my opinion on the Association, and it was only at the urgent request of an official of the Association that I prepared my paper. I went to a great deal of

trouble in collecting data, not only from the Civil War, but also the more recent wars; but I cannot see how I can compress the resulting material into less than sixteen minutes, which, according to the old rule, which I thought was still in force, I expected to have. I can only speak in a general way, and I regret for humanity's sake, not for my own, that I cannot have an opportunity of saying more. The difference between the Civil War wound and that made by the modern military missile is as widely apart as light is from darkness. Whereas, the mortality from wounds of the hip-joint in olden times was 98 per cent., it is now practically nothing, so that certainly there must be something due to the treatment as well as the missile. I have heard a good deal of talk by several surgeons who have never seen a wound inflicted by a military missile, how imperative it was to perform abdominal sections on the battle-field in cases of bullet wounds involving the hollow viscera; but such talk is always indulged in by people who have never been on a battle-field. The current teaching is that a bullet wound of the knee-joint made by a large-calibre missile or a fragment of shell will develop in from forty-eight to seventy-two hours into a suppurative arthritis, and even if only a fissure has extended from the fracture of a long bone into a joint it will result in death; possibly, however, the patient may struggle through after, perhaps, a secondary resection or an amputation. All these statements are absolutely false, and the facts did not warrant them at the time they were made, although some thousands of books are in circulation making this statement. I have not the figures at hand, and cannot give the exact statistics, but I recollect thirty or forty wounds of the knee-joint with but one or two operations and only one death. I wish to call attention to this, that so long as the wound has not been explored it is usually aseptic. The modern bullet, from its relatively smooth surface and the absence of grease, is not septic. If your hands are sterile you can put them in the wound as you please; in like manner as the bullets have been proven by bacteriological examination to be sterile, the only risk to life is usually later infection, frequently the result of exploration. The modern bullet sometimes bores a smooth hole through compact bone tissue, and, very often, through cancellous tissue. It rarely fissures cancellous tissue; but if it does, the fragments are not displaced much, and the resultant functional movements of a joint are much better than one would expect. If the wound is infected, of course the old story is true. If we could only imbue the profession with the idea that there is a

great difference between military missiles and those used in civil life, a great many lives would be saved and a great many joints preserved. Mr. Makins states that when infection did not occur a wound of a joint amounted to no more than an uncomplicated wound of the soft parts, and the question between excision and amputation did not arise. Fixation, after antiseptic occlusion, was all that was requisite, employed for such time as seemed necessary to allow the wound to heal.

Dr. James Bell, of Montreal.

In reference to Dr. Harte's case, his report seems to answer affirmatively two questions which I thought must have been answered negatively. It seems from his report possible to approximate by suture the injured spinal cord and secure good union. I can recall a case of fracture of the cervical vertebræ, with crushing of the cord, in which I attempted to bring the ends together, but with no success, as no form of suture seemed to approximate the severed cord ends. A portion was completely destroyed, and I had no alternative but to make this attempt. In a number of experiments upon dogs I have been able sometimes to fairly approximate the severed ends of the cord, but I have never succeeded in securing union. Perhaps I was not able to keep the animal sufficiently quiet. My conclusion was that the tissues of the cord were altogether too soft and pliable for such approximation. I was interested in Dr. Harte's statement that in all his experiments no function was obtained, and the question still remains, Can you secure union with any restoration of function? I have always believed this to be improbable, and, personally, I have found it impossible.

Dr. R. B. Bontecou, of Troy, N. Y.

I do not know that I can add anything of interest, but I saw a good many cases in the Civil War of gunshot wounds of the abdomen, involving the intestines and the abdominal viscera, of which many survived, the mortality being about 80 per cent. from wounds of the intestine, and 75 per cent from wounds of the stomach alone. I remember one case involving the transverse colon, liver, and chest, in which the man recovered and resumed his duty in the ranks. (Presented photograph.) In those days the wounds were large and the missiles heavy, the bullets weighing about an ounce. The wound of exit was so large that drainage was more easily accomplished than with the small, irregular wounds of the present day. I remember

another case involving the descending colon, which recovered after some little time. (Presented photograph.) Undoubtedly drainage is exceedingly important, and in those days we secured it principally by rubber tubing, no glass tubes being obtainable. As to the case of gunshot wound of the spinal cord, I recall one of a similar nature, although not exactly involving the cord. The bullet entered at the left sternoclavicular articulation, went through to the spine and out between the second and third rib at the back. The man was completely paralyzed, so that when he was brought in on the stretcher his arms were hanging helplessly at his side. After going through a siege of spinal meningitis he recovered, and was able to serve out his time in the ranks. (Photograph presented.)

Dr. W. G. Macdonald, of Albany, N. Y.

It occurs to me that the discussion of gunshot wounds presents itself in a very different standpoint, according to whether it be in military or civil practice, and we cannot discuss them from a common point of view. It is not only due to the character of the projectile, but also to several other circumstances. Men who are not familiar with a field hospital cannot have any possible comprehension of the condition. I cannot conceive of a surgeon just back of the fighting line doing an operation for gunshot wounds. These wounds in civil practice are very different and depend upon the character of the gun. The 38-calibre Colt is a rather ugly weapon, and produces a far more serious wound at close range than does a small-calibre bullet. I have had occasion to treat two cases of gunshot wound of the upper abdomen. One occurred during the strike in this city, the bullet from an officer's pistol passing in at the left of the ensiform obliquely downward, twice through the colon and striking a gall-bladder containing 150 stones which were distributed generally. The man was brought to the hospital with internal hemorrhage, which we succeeded in stopping temporarily at least. We did a cholecystectomy, closed the wound, put in a tampon and drained at the right costal angle. As to posterior drainage, this presents an important problem and a very valuable plan of treatment. In conditions involving the liver, in the neighborhood of the gall-bladder, there is no more direct drainage than at the costal angle, nor any better place to pack in plain gauze. I cannot conceive why one would drain at the back unless there has been injury to the posterior wall of the stomach. I remember within a few months a man who was murdered, hav-

ing received a wound through both walls of the stomach, shattering the spleen. I drained over the left costal angle, but he died six days afterward from the bullet wound in the chest. At the autopsy the abdominal wound was found perfectly clean, and his death was, no doubt, due to septic pneumonia. Another principle presents itself. Wherever a hollow viscus is involved in civil practice we should drain.

Dr. W. L. Estes, of South Bethlehem, Pa.

I would like to refer to a paper which I read some time ago on gunshot wounds in civil practice in which I showed it was the almost universal experience that the conical bullets of the ordinary pistol would carry in particles of clothing. Another feature I have found is that these conical bullets become deviated not only from the actual trajectory, but also as to the direction of the bullet itself when it entered the body, that is, it is apt to be turned on its own axis, thus making a very much larger wound after its entrance than it does when it entered the body. Especially is this true in the peritoneal cavity. I remember one case in which the bullet went through both walls of the stomach, the transverse mesocolon, and lodged in the pancreas. The pancreatic wound was much larger than any other, and contained a piece of clothing. On account of these peculiarities and the great danger of sepsis, I urged the necessity of drainage in the wounds. Another class of gunshot wound in civil practice is from a charge from a fowling-piece. In a case of injury of this kind I treated some time ago, the charge passed through the stomach, grooved the spleen, tore the left kidney into shreds, and lodged in the lumbar region. It was necessary to remove the kidney rapidly. I plugged up the grooves in the spleen by the pressure of aseptic gauze, and established thorough drainage posteriorly, and uninterrupted recovery took place. I emphasized at the time the almost absolute necessity of posterior drainage for these cases. One must make an entirely different mode of treatment and a distinction between civil gunshot wounds and those of military practice. Civil gunshot wounds into the abdominal cavity nearly always require drainage; this is best done posteriorly.

Dr. Harte's case reminded me of one I had some years ago, in which I did an exsection of the cord and approximated the ends, in a man who had been injured by falling from a telegraph pole. He had fractured the ninth and tenth dorsal vertebræ, but unfortunately the operation was postponed until the eighth day. I did a laminectomy. I found the cord was cut entirely through by spicules of bone, a

ragged tearing asunder of the cord. I exsected three-quarters of an inch of the cord, approximated the ends, and united them with catgut. By the union of the membranes, especially the dura, I was assisted very much in establishing continuity of the cord. The patient made an uninterrupted recovery from the operation. He subsequently markedly improved in his trophic conditions, and could stand on his feet with assistance. He had some motion of the muscles of the thigh, and seemed to be progressing toward recovery. He left the hospital on account of lack of room, and died of septic cystitis eighteen months later. A recent case has been very suggestive to me. The whole posterior part of the cord was severed by an injury similar to the last. I united the membranes, but not the cord, as I concluded not to interfere at all with the part that was not severed. Our President now has the patient under his charge for gymnastic exercise; he can use his limbs perfectly well. He is able to walk quite well with the assistance of a brace, and is still improving.

Dr. Theodore A. McGraw, of Detroit, Mich.

I wish to speak of the comparison between the wounds in the recent war and in the Civil War. There are a great many things to take into consideration in such a comparison. I went into the Civil War as a green surgeon. I was first sent to Jefferson Barracks, and then to Chattanooga. Soldiers who have been two years in the service are in a very different physical condition from the man who has only seen two or three months' service, and the former will not recover as quickly as the latter, putting the question of treatment and the kind of bullets entirely to one side. I stayed in Chattanooga through Sherman's advance to Atlanta. The men had been in a rich country before this, and could get rich food. Recovery from bad wounds before this march was much better than it was after the march began, because they did not then have the proper food nor any fresh vegetables. Men who were wounded in the advance on Atlanta were in a bad condition and overworked. I well remember that I, a green surgeon, who knew absolutely nothing, had from 200 to 250 men to take care of. When men have so much work to do in the army they cannot keep records, and I would not give a snap of a finger for statistics of the conditions from Chickamauga to Atlanta. The only record at Hospital No. 1, Chattanooga, for a long time was the card at the head of the bed. The surgeon in charge did not say anything about records. A new surgeon came on who insisted that they should

all be written up, and we did so from memory. Of what good are such statistics? These conditions must be taken into consideration when you are making comparisons.

Dr. S. H. Weeks, of Portland, Me.

As to drainage in case of wounds of the abdominal viscera, I concur in the ground taken by the readers of the papers, who state that drainage should be secured in the majority of cases; but I presume we will all agree that there are cases in which it is not necessary. Each case must be a law unto itself, and each surgeon in charge of a patient must decide for himself whether or not drainage is indicated. I suppose we have all inquired whether or not the late President McKinley might have lived if drainage had been secured, as I believe I am right that it was not. I will report a case as illustrating what I have said. A man was shot by a policeman with an ordinary pistol such as the policemen carry, about a 32-calibre. He was brought into the hospital, when I found he had been shot through the abdomen, the bullet entering just above the umbilicus. From the location of the wound and the great prostration of the patient I was satisfied that the visceræ were injured. I opened the abdominal cavity and found several coils of the intestine had been perforated. There was very little extravasation, and so I closed the rents in the intestine, closed the abdominal wound without drainage, and made no search for the bullet. The patient made an uninterrupted recovery. While I believe that in cases such as Drs. Park and Tiffany reported, where there is an escape of the contents of the viscus, drainage is very essential, still I believe there are cases where it is not necessary. As to the manner of drainage, I do not think it necessary to always drain through the lumbar region. If the lesser peritoneal cavity is invaded, and there is a wound of the liver, it seems to me that this is the best place for drainage, and yet we may be able to do it from the anterior incision. If gauze is used it is well to saturate it, as it drains better wet than dry. Drainage by capillarity answers very well for blood and serum, but tubes are better for pus. It is useless and harmful to search for the bullet.

Dr. A. Vander Veer, of Albany, N. Y.

Notwithstanding Dr. McGraw's censure of the statistics of our Civil War, we must not lose sight of the fact that we now have a wound produced which is not similar to the severe bullet wounds of those

times. I saw many abdominal wounds during the Civil War, but the only kind of abdominal wound that I operated upon during the time I was in the army was that kind that gave me a feeling of horror for the patient where, for example, the intestines were protruding, etc. We enlarged the opening, replaced the intestines, and endeavored to close the wound. We placed a compress over the wound, put on the bandage, and made the patient as comfortable as possible. I remember one remarkable case of a man who was brought from Antietam with a severe wound to the right of the umbilicus. He was in a septic condition, and we looked upon his case as fatal. We kept the wound clean, and one morning about ten days later an orderly came to me and said the man had passed the bullet. Whether or not he had had a previous appendicitis, followed by adhesions, I do not know; but that is a question. I have been much interested in regard to the reports that we should receive from the Spanish-American war. General Patterson, of this city, came to me for treatment shortly after the battle of San Juan Hill. The direction of the bullet in his case was just to the right of the femoral artery, left side, and a trifle below Poupart's ligament, passing out through the sciatic notch. When he came to my office he still had on the original dressing. The wound was perfectly clean and nice, and had healed. I also had an opportunity of examining a number of other wounds later, including one of the ankle, where I found a complete ankylosis. He had a number of abscesses along the leg from an infection received while travelling home, and another one of the foot which did not amount to anything, leaving a nice, clean scar after a good recovery. I have been watching abdominal surgery in this connection for a period of thirty years. I have asked my associates in reference to bullet wounds in civil practice, but they are exceedingly few in this section. One man died on the fifth or sixth day from a bullet wound of the abdomen, who we all thought would have been benefited by an early operation. The cases that I have heard of here have been operated upon promptly. We have had several cases of wounds inflicted by a razor, which makes a good, clean cut. When a cavity is injured we close it, but we always drain. Drainage has fixed itself in my mind, and I look upon gauze drainage as of great value. When operating for a clean wound of the liver or gall-bladder, I use very little gauze if I can possibly get along with a glass drainage-tube, otherwise not. I do not think gauze is particularly beneficial unless you can change it frequently in cases where you wish to drain pus or bloody serum.

As to posterior drainage, I believe it will be of great value in some cases.

Dr. J. E. Owens, of Chicago.

It seems to me a question whether or not an advocate of posterior drainage in gunshot wounds should adopt this drainage in every case. It does not follow, because it is recommended, that he should always use it. Undoubtedly some cases recover without drainage, and I take it that each case affords its own problem for solution at the time. Surgeons will differentiate as to which shall be drained and which shall not. Posterior drainage, so far as I know, has not been insisted upon to any extent previous to this meeting, and the matter has not formally come up for decision. Perhaps it has something to recommend it that has not been mentioned. It is not advisable if it can be avoided, to make drainage through the operation wound. Healing will surely be delayed, and for that reason, when posterior drainage can be carried out, the suggestion may be acted upon.

Dr. Emmet Rixford, of San Francisco.

With reference to the question of non-interference in the management of gunshot wounds of large joints, I would like to report two cases. In the first a wound was made by a pistol bullet of large calibre, which passed through the knee-joint from behind forward, emerging beside the patient's tendon. The case was cared for by a general practitioner, who simply applied a protective dressing and kept the joint at rest. The wound healed readily, but there developed a large arterio-venous aneurism in the popliteal space, for which the patient came under my care. The function of the joint was practically perfect, but the patient was unable to walk because of pain. The femoral artery had been ligated, but not until the aneurism had been excised was the leg free from pain. The other case occurred in the practice of Dr. Huntington, of San Francisco, and was seen by me in consultation. A negro had been shot in the hip a year or so previously, while running away from a policeman. The wound had been treated by non-interference and had healed promptly, but the patient had never since been able to walk because of pain. Dr. Huntington cut down on the hip-joint, removing a 38-calibre bullet from the joint cavity, as well as some fragments of the neck of the femur and the rim of the acetabulum. The patient recovered with a useful hip.

Dr. Robert Abbe, of New York City.

It has always seemed to me that it was practically impossible to bring one severed end of the cord toward the other in an undestroyed bony cavity. In twelve or fifteen cases of this kind I have never seen one where the cord seemed to be sufficiently movable to reach this remarkable limit of three-quarters of an inch. It is conceivable there might be an approximation of the ends of the cord by a resection of a portion of the body of one vertebra, as was proposed some years ago. While that seems to me to be within the reach of surgery, it is rather a severe procedure. The essential question is, Will the cord unite if approximated? and Dr. Harte's case suggests this possibility. We see no restoration of the function of the cord, however, in those cases where it is severed experimentally, while occasionally we do see a restoration of function in nerves in other parts of the body. Yet one cannot easily get restoration. I have one case now that I have watched for years, where I thought I had made a good connection of severed musculospiral nerve, and no return has followed. We must conceive that there is in the nerve filaments a selective action, and, if this is possible, we must be sure we are making exact approximation. If one out of fifty cases does well we cannot consider that there was a much nicer approximation in that case than in the other. Dr. Harte's case offers renewed hope, and I shall continue to try to approximate the ends, although I hardly expect to accomplish much.

Dr. John Wheelock Elliot, of Boston.

I do not think the dictum should go out that this Association is in favor of posterior drainage for all abdominal gunshot wounds. In the abdominal cavity we have conditions different from any other part of the body. Intra-abdominal pressure makes a more or less water-tight joint, and if this is not complete the handling and irritation of the intestines usually causes adhesions which make a water-tight joint. I think that posterior drainage would not be applicable in some cases. Suppose the small intestines to be perforated in the anterior part of the abdomen. Autopsy would show the intestines glued together, and the scene of infection would be near the anterior abdominal wall. I think that drainage should be made directly to the nearest point from the infected part of the cavity. I used to use drainage-tubes, and it was a long time before I gave them up. I now believe gauze is better. If you leave a large opening, and change the gauze with retractors, so that you may look in and see if there is any

pus collecting, I believe your results will be good; but frequent changes of the gauze are very necessary if infection has occurred. In changing the gauze you put in less each time, and the intra-abdominal pressure closes the cavity. The gauze can be used dry while a tube has to be washed out, which is much less satisfactory.

Dr. L. L. McArthur, of Chicago.

We are inclined too much to a gloomy picture of acute infections of large joints. It has been here stated that "98 per cent. of the infected joints used to be and still are fatal." I am convinced a very much more favorable prognosis can be given at the present time. I have three times in the past year taken an acute traumatic infective process in the knee-joint, and saved motion as well as the limb and the life. This can be done only by extremely prompt and radical drainage—*i. e.*, within the first to the fourth day. I have not used so radical a measure as that of sawing the patella through transversely. With a generous lateral incision each side of the patella from the quadriceps tendon down to the tubercle of the tibia, packing with gauze, and later putting a cast around the joint, it has been possible to check processes in joints which in the past have been regarded as fatal.

Dr. J. M. T. Finney, of Baltimore.

I would like to corroborate what Dr. McArthur has said, and have had some little experience in this connection, for I remember a case of a young man who was shot in the knee by a very small-calibre pistol. The knee-joint was enormously distended with pus, and cavities ran up the thigh as far as the great trochanter. I established very free drainage and secured excellent results. I excised a considerable portion of the synovial membrane of the knee, and yet the patient recovered with fair function of the knee. In similar cases operated upon under very unfavorable circumstances by means of large lateral incisions into the knee, good results have been obtained without any functional impairment whatever. These two cases have given me great hope for operative interference in these joint cases. The size of the surgeon's finger has a great deal to do with the success of these cases. It has been said that all pistol wounds of the knee-joint are infected and ultimately will lead to amputation.

Dr. McGraw. My remarks might have looked as if I was making a criticism on the statements of Dr. Nancrede, but such was not the

case, as I agree with Dr. Nancrede in his comparison of the surgery of the present day with that of the Civil War, which, as he says, cannot be made. There was never a time in the last war when they had such a number of wounded that they could not all get prompt attention. If you let a man lie in the mud for several days when he is wounded, things will be very different.

Dr. Vander Veer. I do not wish to be understood as not being in favor of gauze drainage. If you can drain through the posterior part of the peritoneal sac connected with the lesser omentum, a rubber drainage-tube will be found of great value, while if you drain anteriorly in contracted gall-bladder, a glass tube surrounded by gauze is better if changed frequently.

Dr. Park (closing). Posterior drainage has never come up before for thorough discussion, and my object in reporting this case was with a view of bringing it up. I have been much gratified by the opinions expressed, and I wish this discussion had been held a year ago.

The case reported by Dr. Harte is one of peculiar interest, and shows the difference between laboratory research and clinical experience. We are all familiar with laboratory investigations in endeavoring to regenerate the spinal cord, and this case completely upsets these results. I remember the case of a man who had been shot through the chest, the bullet passing backward to the spinal column. There was no question about the injury, as the man was completely paralyzed. The only point was, could anything be done? I exposed the spinal cord about the region of the injury, and as I opened the spinal canal, finding the cord completely crushed by the bullet, there was a passage of air through the opening in the spine, so that the patient was able to breathe through it. The case was hopeless, the air passing through the injured lung in and out through the spinal column.

Dr. Tiffany (closing). In reference to Dr. Harte's case, I would mention two cases in which I failed entirely to bring together the severed ends of the spinal cord. I decided I would hereafter unhesitatingly take out the body of a vertebra and, if necessary, wire the contiguous vertebræ together. I think this is the thing to do, but I have not yet had a case to try—an opportunity to put my opinion in practice. I did not decide to do this until after I had had my two cases.

As to the bloody vomit in stomach wounds, this is uncertain. I have seen two gunshot wounds of the stomach and two stab wounds, and in all there was not bloody vomit.

As to posterior drainage. A large number of abdominal wounds are associated with wounds of the thorax. It must be remembered how high the stomach rises in the curve of the diaphragm. A gunshot wound of the liver and stomach may go through the chest just below the transverse neighborhood of the nipple line, and in these cases posterior drainage would not be attained except by going through the chest cavity. Some cases will certainly recover without drainage. I remember one that got well where there were eight intestinal wounds and four mesenteric ones. On the other hand, I have seen cases do badly without drainage which recovered by being opened and drained. I do not think a surgeon should suppose that a wound may not be infected, as it certainly is if it goes through the intestines. We should not wait for several days before acting. If the posterior wall of the stomach is wounded the omentum will require to be torn through, and a strand of gauze can be laid behind the stomach and the drainage carried forward through the anterior wound just as well as if there were a posterior opening. Gauze will drain as well up hill as down. I think it expedient that the peritoneal cavity should be wiped dry. In one of the cases I have reported the gauze drainage was changed on the sixth or seventh day, and not until then. Even then it was only done because the drainage had ceased, it having been enormous the first few days. I take it that as soon as gauze is put in and the vessels are filled with salt solution, the drainage begins. The drainage gauze does not need changing sometimes until the patient is out of danger.

Dr. Nancrede (closing). I feel as if I had been fighting the air, as everything that has been said is in my paper, either specifically or by clear inference. I called particular attention to the fact that statistics should not govern but guide action. I do not deny that statistics have done an immense amount of harm, for they have led to the teaching that I objected to. Whether there is any truth in the statistics or not, I do not know, but I cannot understand how it is that a man should say all pistol wounds of the knee-joint are infected, when the reports that come from the Philippines do not bear out this statement, nor have I been able to find any such. I also call particular attention to injuries of other joints as well as the knee-joint.

I did not base my remarks on the experience of a "little war," but on many thousands of wounds in Cuba, the Philippines, and the South African war. If one's statistics deal with a sufficient number of cases, and are taken in conjunction with one's own experience, I think one is warranted in stating that certain things are true or they are false. As to whether the surgical details of this "little war" were carefully attended to, if one believes the newspapers, there was no no one to look after the wounded. In my experience, we had six to eight surgeons to attend to about fifteen hundred wounded, and I rested for only a few of the ninety-six hours. Naturally, this incapacitated me and my colleagues from doing our best work, quite as much as it did Dr. McGraw and his colleagues.

Of course, you cannot discuss my paper if you do not know the scope of its contents. I still contend that if you have knee-joint wounds, with smashing of the bone, and almost without exception get good results, and then you have, say, 500 knee-joint wounds with invariably bad results, I do not see how you can deny that modern treatment as well as modern missiles have much to do with the results. In the Spanish-American, Philippine, and South African wars there were about 30,000 killed and wounded, and if the consensus of testimony of such men as Sir William MacCormac, Mr. Makins, and Sir Frederick Treves are of any value, everyone bearing out almost identically the same thing that I have tried to prove, I think that statistics properly employed are of some value.

If I had been allowed to read my paper time would have been saved, as much that has been said in this discussion would then never have been uttered.

REMOVAL OF THE BLADDER AND PROSTATE FOR CARCINOMA THROUGH A SUPRA-PUBIC OPENING.

By M. L. HARRIS, M.D.,
CHICAGO.

As a contribution to the subject, "The Choice Between the Suprapubic and Infrapubic Methods of Reaching Tumors and Other Surgical Lesions of the Pelvic Organs," the following case is presented:

Mr. G., aged fifty-three years. No hereditary tendency, so far as known, to malignant disease. His general health had been good up to the time of the present trouble. About a year ago he accidentally discovered blood in the urine. This soon disappeared, but after a short time was again noticed. From now on we find a history of gradually increasing frequency of urination with intermittent hæmaturia and pain. After some months his general health began to fail, so that when he presented himself to the author, on October 2, 1901, for examination, it was found that he had lost considerable flesh and was suffering quite a little pain in the region of the neck of the bladder, and was obliged to urinate rather frequently, day and night. The urine contained blood, the amount of which varied considerably from time to time. There was also a small amount of pus and some albumin, probably depending upon the amount of blood and pus present. No casts nor tubercle bacilli were found. Upon rectal examination the prostate was found somewhat enlarged, quite firm, irregular, and tender. The passage of a sound was very painful. On this account an anæsthetic was given in order to make a cystoscopic examination. The cystoscope revealed a bleeding mass, involving the trigonum and extending beyond the ureteral openings. A diagnosis of carcinoma of the bladder, probably extending to the prostate, was, therefore, made. As no other abnormal conditions were found on examination, an operation was advised.

The operation was performed October 5, 1901, in the following manner: A median longitudinal incision, about 8 cm. in length, was made just above the symphysis and opening into the cavum Retzii. The peritoneal fold was crowded upward, the bladder exposed, opened, and the growth carefully examined. This was found to involve the entire trigonum and to extend quite a little above both ureteral openings. It was apparent that the growth in the bladder wall had involved the prostate, and it would, therefore, be necessary to remove the base of the bladder and entire prostate *en masse*. The bladder was freed by blunt dissection on each side as far down as the base. The urethra was now divided close to the triangular ligament, and beginning at this point and working backward and upward the prostate and bladder were separated from the rectum. This, which was the most difficult part of the operation, was much facilitated by an assistant introducing two fingers into the rectum, thus raising all the parts well forward. The hemorrhage during this part of the operation, although considerable, was not as severe as was anticipated, and was materially lessened by keeping the bladder well drawn forward; that is, toward the suprapubic opening, as fast as it was separated from the rectum. The ureters, as soon as they came into view, were easily divided beyond the disease. The right ureter was considerably enlarged and tortuous, owing to the obstruction which the growth had produced at the ureteral opening. Some small, enlarged lymph glands which were found in the connective tissue to the side of the bladder were removed. As the vertex of the bladder was not involved in the diseased process, a portion of it, about 6 to 7 cm. in diameter, was retained. The remainder of the bladder and prostate was removed. Small slits were made in the remnant of the bladder, and the ureteral ends drawn through and stitched with catgut. This small portion of bladder was then stitched by its edge to the inner edge of the suprapubic opening, except at the lower part. The cavity in the pelvis was packed with gauze and a large rubber drainage-tube inserted to the bottom of the cul-de-sac. The peritoneal cavity was not opened. Time of operation, about one hour and thirty minutes. There was considerable shock following the operation, but this was slowly recovered from, and in about two weeks the patient was able to sit up. The cavity filled in quite rapidly, and the tube was soon dispensed with. In about a month the patient had gained in strength so as to be up and around. The ureteral openings in the small, practically exstrophied bladder were easily seen, and the urine escaping from them was clear and, on analysis, normal, with the exception of a small amount of pus from the surrounding parts. On drawing the

edges of the suprapubic opening together the lower part of the small bladder would dip slightly behind the upper edge of the symphysis pubis. A catheter introduced through the penis reached the small bladder, and nearly all the urine would drain off through the catheter. It was, therefore, retained permanently in position. The patient was walking out-of-doors daily, and his general health was improving rapidly. During the latter part of November, while out-of-doors one day, he was taken with a chill and developed a right-sided croupous pneumonia, from which he died, December 3, 1901.

Autopsy, shortly after death, by Dr. Herzog, Professor of Pathology, Chicago Polyclinic. Recent plastic lymph over lower portion of right pleura, with small amount of serous fluid in the pleural cavity. Lower half of right lung in beginning gray hepatization of croupous pneumonia. Left lung congested. Heart normal. Liver, spleen, and intestinal tract normal. The kidneys, ureters, remains of bladder, penis, and rectum, together with the surrounding tissues, were removed in a mass for study. The right kidney was small and atrophied, measuring 7½ x 4 x 3 cm. Interstitial nephritis. The left kidney measured 11½ x 7½ x 4 cm. It was normal in structure. The ureters were patent throughout and their openings free. The right ureter had contracted again to about its normal size. Considerable connective tissue was found between the small bladder and the rectum and the lateral walls of the pelvis. An interesting point is the remarkable formation of a tongue-shaped process lined with epithelium, continuous with the lower end of the bladder, surrounding the catheter, and extending almost to the posterior end of the urethra, a distance of some 5 or 6 cm. Metastases were found in the shape of a few enlarged glands near the bifurcation of the aorta and one quite large lymph gland near the hilus of the left kidney.

Microscopical examination of that portion of the bladder and prostate removed at the operation: That portion of the section directed toward the interior of the bladder presents a marked proliferation of atypical epithelial cells, the surface being ragged and irregular. As we proceed toward the deeper parts the epithelial mass sends out prolongations of epithelial cells, which soon break up into typical epithelial masses surrounded by connective tissue of varying thickness, thus forming distinct alveoli. The muscular layer is broken in places where it is penetrated by the epithelial masses. These masses extend into the prostate itself, which is quite extensively involved in the process. The microscopical examination thus leaves no doubt as to the carcinomatous nature of the growth, which began in the mucosa of the bladder and involved, secondarily, the prostate gland.

It is not the intention to present a detailed analysis of the cases of extirpation of the bladder, partial and complete, for carcinoma, as that has already been done by Wendel.[1] According to Wendel, the immediate mortality after complete extirpation is 60 per cent. (ten cases, six deaths). After partial extirpation, 24.5 per cent. (fifty-seven cases, fourteen deaths). This enormously high death-rate is due mostly to two causes, viz.: shock or collapse and uræmia. The first of these (shock) in some degree is almost a necessary accompaniment of so serious and severe an operation as urocystectomy, and will only be materially reduced when an improved technique diminishes the amount of blood lost and cuts short the time of the operation. The other cause of death, uræmia, is due to the prolonged effect of the anæsthetic on perhaps already diseased kidneys and to the necessity of interfering with the ureters. The implantation of the ureters into the rectum or other part of the bowel, as was done in a number of these cases, has now been shown to be an unjustifiable operation, as death is almost certain to follow, sooner or later, from an ascending pyelonephritis. In the female the vagina provides a means of escape from this dilemma, but this is denied us in the male. It is, therefore, particularly in this class of subjects that the plan of retaining a portion of the bladder wall, however small it may be, into which the ureters are to be implanted, and the whole to be partially stitched in the depth of the lower angle of the wound as near the posterior end of the urethra as possible, as described in the case here recorded, is recommended. It is very rare, indeed, when the bladder is so extensively involved in the carcinomatous process that a small portion of its wall, from some part or another, cannot be saved. It is all the more favorable to this method that the mucosa of the bladder contains no lymphatics, and metastasis in the mucosa by means of these channels is thus not the rule.

The reproductive power of the bladder is so remarkably great that even the smallest portion saved may, in a short time, develop into quite a comfortable receptacle for the urine. The author's attention was first directed to this fact by a case of traumatic rupture of the posterior urethra in a bicyclist.

[1] Beiträge zur klin. Chir., 1898, Bd. xxii. S. 243.

After his fall he found he was unable to urinate, and, being some distance in the country, was obliged to ride his wheel several miles to the city before he could secure relief. The physician whom he consulted endeavored to draw the urine with a metal catheter, and in so doing made several false passages leading into the prevesical space and injured the anterior wall of the bladder. Extravasation of urine throughout the prevesical space and perineum occurred, to which infection was soon added. When first seen by the author he was in a serious condition. A suprapubic incision was made and the bladder found in a sloughing condition. A large slough several centimetres in diameter, and composing the major portion of the bladder, with the exception of the trigone and a bit of the posterior wall, was removed. A perineal incision was added, and through-and-through drainage established. After some months the perineal and suprapubic openings closed. He could hold his urine at first an hour or so, and later five or six hours, and could go all night without difficulty. In this case practically an entire bladder was reformed from the base.

The remarkable regenerative power of the bladder has likewise been shown by Schwarz.[1]

The points to which it is desired to direct attention in this brief article are:

1. The suprapubic route for the removal of the bladder and prostate for malignant growths.

2. The method of operating, which consists in dividing the urethra at the triangular ligament, and working from before backward in separating the prostate and bladder from the rectum, aided by an assistant's fingers introduced into the bowels.

3. The use of constant traction on the bladder toward the suprapubic opening as fast as liberated from below as a means of materially reducing the amount of hemorrhage.

4. The retention of a portion of the bladder wall, however small, into which the ureters are to be stitched, and the whole to be fixed as near the posterior end of the urethra as possible, with a view to its ultimate regeneration into a serviceable bladder.

[1] Lo Sperimentale, Anno xlv., Fasc. v.–vi., p. 484. Ref. Deutsch. med. Woch., 1892, S. 696.

ANATOMICAL AND TECHNICAL REASONS WHY THE PERINEAL IS PREFERABLE TO THE SUPRAPUBIC ROUTE IN PROSTATIC SURGERY.

By JAMES E. MOORE, M.D.,
MINNEAPOLIS.

Up to the present time patients suffering from enlarged prostates have not received the relief to which they are entitled, and we begin to realize that the catheter is but a makeshift. It doubtless served a good purpose in pre-antiseptic days, but with our present methods it is an open question whether, by preventing early operation, it does not do more harm than good. Many good surgeons believe to-day that a prostatic's real danger begins with the use of the catheter.

It is very fitting that we should at this time exchange views and experiences upon this subject, for we ought to be able to say to these sufferers when they arrive at a point where they can no longer empty their bladders without artificial aid, that we have an operation that will quickly and safely relieve them. We owe it to ourselves to so perfect our technique that we can conscientiously recommend the operation to them before their bladders and kidneys have become dangerously infected. It is not in keeping with modern surgery to accept as the only indication for radical treatment a threatened breakdown in catheter life. The more perfect our technique for the radical operation the less use we shall have for the palliative operations, because it is only after radical operation that the cure is complete and permanent. We must popularize the operation so that we may gain permission to perform it early.

The present lively interest manifested in the subject is in marked contrast to what it has been in former years. In the nineteen years' history of this Association very few papers have been read upon this topic.

In 1885 Gouley read a paper describing a set of new instruments for the performance of Mercier's operation. He reported nine cases in which he performed this operation, with one death and three recurrences. He advised the use of the catheter in all cases after the operation. He mentioned Bottini's operation, but questioned its utility. In the discussion of this paper S. W. Gross recommended perineal prostatotomy.

In 1888 Hunter McGuire read his classical paper on "Formation of an Artificial Urethra for Prostatic Obstruction."

In 1893 J. W. White read a paper entitled "Present Position of the Surgery of the Prostate," which excited world-wide attention. He spoke favorably of suprapubic prostatectomy and of prostatotomy, but condemned perineal prostatectomy because he claimed that in only one-third or one-fourth of the cases could the prostate be reached by this route. The chief point in this paper, however, was the suggestion of castration as a method of treatment for enlarged prostates.

In 1895 White and Mears reported cases treated by castration.

In 1898 Lane contributed a very brief paper advocating suprapubic prostatectomy.

This is certainly a very small showing for so important a subject in so long a time, and is in marked contrast to the literature upon analogous conditions in women during the same period. This lethargy was probably largely due to our mistaken belief as to the influence of age, *per se*, upon surgical operations. Age is no contraindication to prostatic surgery so long as the kidneys are not too far gone.

Although the writer has done most of his prostatic work by the suprapubic route, he is convinced that the perineal operation is the operation of the future. In arriving at this conclusion careful dissections have been made and specimens preserved. A number of the specimens will be shown upon which some of the opinions here expressed are based.

It seems rational to conclude that the surgeon who hopes to achieve the greatest success should be able to perform each of the different prostatectomies with equal skill and be able to choose the one best fitted to each individual case, but the tendency is to popularize one method, and to so perfect it that it becomes applicable to the vast majority of cases. It is of interest in this connection to recall the history of lithotomy. Although the suprapubic operation for stone was introduced in the sixteenth century, it was looked upon with disfavor until within a very few years. In Agnew's *Surgery*, published in 1889, the author states that the suprapubic operation is four times as dangerous as the lateral perineal, and advises that the upper operation be employed only when the stone is very large, but at the present time the upper operation is universally accepted as the safest and best cutting operation for stone.

The writer became a believer in the feasibility of the perineal route for prostatectomy through his experience with massage of the prostate through the rectum. In many instances the prostate could scarcely be reached through the rectum, but it was found that by introducing a short-curved sound and turning it over, pointing the tip toward the rectum, the prostate could always be dragged down so that every part of the gland, and even the base of the bladder beyond it, could be easily reached.

From an anatomical standpoint every fact is in favor of the perineal and against the suprapubic route. The cystitis in these cases is always secondary to the prostatic changes, and no matter how severe it may be it improves rapidly after removal of this mechanical cause followed by drainage. We have all repeatedly demonstrated the fallacy of the belief that the bladder has undergone irreparable degenerative changes in chronic cystitis from enlarged prostate. The bladder is not the offending organ, and is not the one to be operated upon in these cases; but in order to reach the enlarged prostate by the suprapubic route, whether the enlargement be in the lateral or central lobes, two and sometimes three openings must be made into it. Each of these openings, made into a viscus with septic contents, must

have an independent mortality rate, and should be avoided if possible.

The prostate is not developed until puberty, and its function evidently has to do with generation and not with urination. It has been clearly demonstrated that its removal does not interfere with urination or bladder control. It must be, therefore, that when a patient loses control of his bladder, as sometimes happens after a prostatic operation, it is due to injury to the bladder itself. By the suprapubic route serious injuries to the bladder are essential features of the operation, and the amount of injury cannot always be controlled, but by the perineal route the bladder need not, and should not, be injured. Although some of the muscular fibres of the bladder are continuous with the prostate, a good, thick bladder wall is left after the prostate is removed. Even when the third lobe projects well into the bladder it pushes the bladder wall ahead of it.

The prostate lies entirely outside and below the bladder, being much nearer the perineal than the abdominal surface. The writer has made careful measurements on the cadaver, and has found that from the surface of the skin to the prostate is twice as far by the upper as by the lower route. The approach by the perineal route is through comparatively unimportant anatomical structures. The transverse and horseshoe incisions in the perineum as originally made for prostatectomy are open to the same objections as the upper operation. They are too much surgery and offer a large field for infection. They sever arteries and nerves and cut muscles crosswise. The median perineal incision, however, has none of these objections. It permits access to the prostate by the most direct route; it severs no bloodvessels or nerves, and it separates muscular tissue along a natural line of cleavage.

After total prostatectomy by either route the generative function is probably abolished, because the ejaculatory ducts are destroyed. The act of copulation can be performed, but it is scarcely possible that the contents of the vesiculæ seminales can reach the urethra, and if it should the chances are that, lacking the secretion and the ejaculating force of the prostate,

it would get no further or would lose its efficacy in transit. Fortunately our patients are at the age when they have very little concern for this function, and are perfectly content if they can present a good appearance.

Some writers claim to have performed total prostatectomy by the suprapubic route with preservation of the prostatic urethra.[1] The organ can be completely extirpated by either route, but the preservation of the whole urethra is an anatomical impossibility, because of its close attachments at the point of entrance of the ejaculatory and prostatic ducts.

When a total prostatectomy is performed the prostatic urethra must always be seriously injured and often destroyed. The perineal route offers much better opportunity for careful dissection and preservation of the parts. While the prostatic urethra has often been sacrificed in total prostatectomy without serious results, it is theoretically objectionable because of the tendency to stricture. Murphy[2] calls attention to the fact that the removal of the bridge, or that part of the prostate between the urethra and the bladder, is entirely unnecessary, as it shows no tendency to hypertrophy. The so-called third lobe, it should be remembered, is not a part of the bridge, but is a projection from the lateral lobes backward beyond the inner opening of the urethra. By the perineal route the lateral and third lobes can be removed, and by leaving the bridge only a small portion of the floor of the urethra need be sacrificed. Through this opening in the floor of the urethra the bladder should be entered, thus preserving the anatomical integrity of that organ. This is one of the strong points in favor of the perineal route.

The suprapubic operation has been the operation of choice, because within the past few years it has become so popular as the route for lithotomy, and because the third lobe is so easily reached in that way. A surgeon who is competent to perform prostatectomy does not need to have the technique made easy for him, and our present technique of the perineal operation is not specially difficult. In fact, for the removal of the lateral

[1] Freyer. British Medical Journal, February 1, 1902.

[2] Journal of the American Medical Association, March 29, 1902.

lobes as found in the majority of cases the technique of the perineal operation is less difficult than that of the suprapubic. The operator's fingers grow longer in this operation as he grows in experience.

Prostatectomy by either route is not ordinarily alarmingly bloody, but when hemorrhage does occur it is much easier to control in the perineal operation.

In a patient with healthy kidneys the most imminent danger after a prostatectomy is sepsis, and the facilities for drainage after the perineal operation are infinitely superior to those after the upper operation. The suprapubic operation leaves one or more deep, ragged holes in the dependent portion of the bladder in which the septic contents of the bladder naturally collect, and infection is very liable to occur. The most successful operations by the suprapubic route are those in which perineal drainage is established. Since the feasibility of removing the prostate through the perineum has been demonstrated it seems rational to choose this route, thus avoiding injury to the bladder and providing for efficient drainage through the urethral opening and the operation wound. Urine can be efficiently drained off through the upper opening, but the detritus cannot.

Those objecting to the perineal operation claim that there is too little room and that the prostate cannot be reached. Either the modern inverted Y-shaped or the semilunar incision afford a much better approach to the gland than the suprapubic, and the structures cut through are much less important than the bladder walls. Through these incisions the operation can be performed under the eye, while the suprapubic operation is all in the dark. It has been demonstrated that in the majority of cases the prostate can be readily removed through a straight incision from the scrotum to the anus. Ferguson[1] says that any prostate can be removed through this incision, the secret of success being to keep well within the capsule and to pull or push the gland well down.

[1] Paper read before the Western Surgical and Gynecological Association, December, 1901.

The writer believes that the perineal route is safer and better than the suprapubic route for prostatectomy in all cases except where either the third or lateral lobes are very soft and vascular and project far into the bladder. The operation is still in its infancy and can be greatly improved. The present operation in which the gland is pulled down by a staff in the bladder or by hooks and forceps from the outside is a very great improvement upon the bimanual operation in which the bladder is unnecessarily injured. In my opinion a complete prostatectomy is seldom the operation of choice. Removal of the lateral lobes and the third lobe, when present, leaving the isthmus and preserving the greater part of the prostatic urethra, will relieve our patient's suffering and will be followed by better functional results. It is also within the range of possibility to remove a large part of the prostate without injuring the ejaculatory ducts, which will be a more important point when we begin to operate on younger men. This can all be done in the majority of cases through the median incision. In the exceptional cases where this incision does not afford ample room it can be changed into the inverted Y-incision by adding a lateral incision outward and backward toward the tuberosity of the ischium on either side. These lateral incisions should go down to the perineal muscles, but not through them, and they should not involve the sphincter. This incision gives abundant room and is not open to the same objections that can be made to other perineal incisions, and it also avoids the mutilation of the unoffending bladder incident to the suprapubic operation. When this incision is made and narrow lateral retractors used the prostate can be pushed or pulled down so that the parts are as well exposed and as easy to reach as in a vaginal hysterectomy. The writer has found that at the beginning of the operation a Ferguson staff or an ordinary short-beaked steel sound will bring the gland down within easy reach, but that after the capsule is dissected well back it is often an advantage to remove the staff and depend upon instruments with which one can take hold of the prostate and drag it down.

A small-sized Hanks vulsellum forceps answers the purpose

admirably. When the lateral incisions are made they can be closed up at once.

Specimens will be shown demonstrating the following points:

1. The feasibility of shelling out either the lateral or the third lobe from below.
2. The relations of the prostate to the bladder.
3. The relations of the prostate to the urethra.
4. The relations of the prostate to the rectum.

PERMANENT SUPRAPUBIC DRAINAGE FOR ADVANCED TUBERCULOSIS OF THE BLADDER. REPORT OF A CASE AT END OF FIVE YEARS.

By CHARLES A. POWERS, M.D.,
DENVER.

Mr. B., a man aged fifty years, was referred to me by Dr. S. A. Fisk, of Denver, February 1, 1895. His wife and two daughters died of pulmonary tuberculosis. He had had for years a moderate cough from time to time, but had never spit blood and had given no definite evidence of pulmonary disease. During the past year he had had an increasing irritability of the bladder. Urination had gradually become more frequent. There was very marked spasm of the bladder when he moved about. Vesical discomfort and tenesmus were now urgent. During the last few months he had twice been examined by surgeons, with negative result. He had spent a considerable portion of the last year in hospitals; had rested throughout the preceding summer, but without improvement.

Examination. The patient is a man of rather spare physique, who appears to be between sixty and sixty-five years of age. Examination of the chest is negative. He urinates every half-hour both day and night. He takes three-quarters of a grain of morphine daily. His bladder capacity at this time is about one ounce; there is about one-half ounce of residual urine. The urine is pale, neutral, its specific gravity 1014. It contains bacteria, bladder epithelium, mucus, and a little pus. Tubercle bacilli are sought, but not found. Cocaine examination for stone is negative, the introduction of the searcher causes slight bleeding. Cystoscopic examination is recommended, but refused. So far as one can judge there is no other tubercular lesion of the genito-urinary tract. The patient was at that time treated by me locally for two weeks, with practically no improvement.

I next saw him in December, 1896. During the interval he had travelled here and there throughout the country, and had consulted many physicians, but had grown worse rather than better. He at that time urinated every ten or fifteen minutes day and night. He had marked spasm at the neck of the bladder, and his life was in all ways miserable. He was taking about four grains of morphine daily. There was marked hæmaturia most of the time. He was examined under chloroform December 26, 1896. Bladder capacity about six drachms. Cystoscopic examination revealed an irregular ulcer three-quarters of an inch in diameter at the neck of the bladder posteriorly. This ulcer bled very easily. No stone was found. After prolonged search Dr. H. C. Crouch, State Bacteriologist, reported that he found scattered tubercle bacilli in the urine. Permanent suprapubic drainage recommended.

Operation. At St. Joseph's Hospital, February 8, 1897. Chloroform. Trendelenburg position. Bladder distended with about one ounce of filtered air. Suprapubic incision. Peritoneum not recognized. Gaseous bladder felt. Incision just above and behind pubes. Opened bladder, which was drawn up. It was apparently not larger than an English walnut. The entire wall was thickened, intensely congested, and studded here and there with miliary tubercles. There was an irregular ulcer the size of a penny at the neck posteriorly, rather more on the left side. This ulcer was gently curetted and its base cauterized with pure carbolic acid. It bled pretty freely. The bladder was drawn up and its edges stitched to the skin. It seemed to resemble in size and shape the finger of a glove. The orifices of the ureters were not seen. A large drainage-tube was placed in the bladder, care being taken that its end should not touch the posterior wall, and the bladder was tightly sewn about it. The outer wound was partially closed.

The patient reacted fairly well, secreting urine freely. During the first few days morphine was given liberally. The bladder and wound were scrupulously cared for by a competent nurse, and the patient was kept dry. The bladder was frequently washed out with a very weak bichloride solution, followed by a boric-acid solution. The abdominal wound above and below the sinus healed throughout by primary union. The patient was out of bed on the tenth day, and at the end of three weeks was wearing a permanent tube and urinary receptacle. At that time his morphine had been decreased to two grains daily. A month later he resumed his occupation, that of travelling auditor for

a large national corporation. During the two or three months immediately following the operation there was occasionally moderate leakage about the tube. The tube itself was a soft-rubber catheter, size 30 of the French scale, having a velvet eye at the end as well as at the side. It was carefully adjusted and well held in place. Twice daily the patient removed and boiled the entire apparatus and washed out his bladder. His relief from suffering was marked and he was quite comfortable. His spirits returned, he gained in flesh and strength, and was able to decrease his morphine to something less than a grain daily. Three months after the operation I judged the tubercular ulcer to be healed.

The patient continued from year to year in a comfortable and generally satisfactory condition. At no time did I think it wise to recommend removal of the tube and closure of the fistula. I saw and examined him yearly, as once a year his business brought him to Denver for two or three weeks. I last saw him in the summer of 1901, four and one-half years after operation. At that time he was in better weight and general health than in many years; he was comfortable except for the nuisance of the urinary fistula. The tube fitted snugly. The sinus would leak a trifle occasionally, but hardly enough to be a disagreeable factor. The patient expressed himself as eminently satisfied with the result. I did not examine the interior of the bladder.

This man's home is two thousand miles from mine. In order to know something of his present condition I wrote to him under date of February 14, 1902, and received the following reply:

"During the first nine months of the past year I was better and had less trouble and worry than at any time since the operation. I weighed more than at any time in my life and attended to business constantly. During the past three months, however, the condition has changed. About November 1st of last year I put in a new tube. I think that this was rough and irritable. It made the sinus sore and led to leakage. Of late the soreness has disappeared, but more or less leakage continues. I have lost in weight and am less comfortable than formerly; but, as I say, I attribute the discomfort to an ill-fitting tube."

To sum up this case: a man fifty-two years of age had suffered for some time from vesical tuberculosis. The bladder was very small; urination was almost constant. Local treatment made him worse rather than better. A permanent suprapubic fistula

gave him comfort and relief, and under this the tubercular ulcer healed. Up to four and three-quarter years after operation he made progressive gain in health, strength, and weight. At this time the introduction of a badly fitting tube led to discomfort and leakage, and, it may be, to tubercular relapse. I judge it probable that he will regain the lost ground after the bladder is again drained in a suitable way.[1]

As one searches the literature of this subject he cannot but be struck by the paucity of carefully recorded cases. Most writers on vesical tuberculosis say that suprapubic drainage should be made in suitable instances, but very few cite cases in which this has been done or detail complete histories. Thus, in a discussion on "The Value of Surgical Intervention in Tuberculosis of the Bladder," before the International Medical Congress of 1900, Saxtorph,[2] of Copenhagen, spoke at length on occurrence, pathology, symptoms, etc., but contented himself with the statement that his operative results have been mediocre. Loumeau, of Bordeaux, reported in general on twelve operations. One of these was done for palliative effect alone; of the other eleven cases three were cited as relative cures (no details given); eight were said to still preserve a suprapubic opening. Various periods up to three years had elapsed.

Strauss[3] in one instance opened the bladder above the pubes, cut out and scraped out a tubercular ulcer, and sewed the bladder up. After a secondary operation for fistula he gained healing, which lasted five years. J. J. McGrath[4] reports a result, said to be a cure, ten months after operation. The bladder was studded with miliary tubercles; there were several small ulcers present. The bladder was drained for about six weeks and washed out daily.

It is probable that a true primary tuberculosis of the bladder is very rare. The lesion is generally secondary to tuberculosis

[1] A letter received May 1, 1902 from the patient says that he is again comfortable. He has a suitable tube, has regained the lost weight, and is doing well both locally and generally.

[2] Centralblatt für Chirurgie, 1901, S. 81.

[3] Wiener med. Woch., 1897, No. 51.

[4] New York Medical Journal, January 21, 1899.

of some other part of the genito-urinary tract, extending from the kidney above or from the testis, prostate, or seminal vesicle below; or it may be secondary to lung tuberculosis; or, as I believe to be the case in the patient who is the subject of this communication, to tuberculosis of the bronchial glands.

Mansell Moulin[1] thinks that when a tubercular ulcer of the bladder is found at or near the orifice of a ureter it is sufficient evidence of tubercular kidney. Battle has operated (no details) on six cases, in none of which has he been able to find evidence of tubercular disease elsewhere, but he admits that it is often difficult to say whether the disease is primary or secondary.

The management of vesical tuberculosis in its early stages should rest upon the establishment of the best possible hygienic conditions. Nutrition should be improved to the greatest possible degree. Bodily rest will aid. In general one may say that climatic and other conditions best adapted to the successful management of pulmonary tuberculosis are also best calculated to bring about the arrest of a tubercular process here. After a residence of eight years in a dry climate of high altitude, I feel convinced that the average case of so-called surgical tuberculosis pursues a more favorable course here than at the sea level.

Instrumentation of the bladder should be avoided when possible. The bladder should never be distended. When urination begins to reach the incessant stage and cystalgia is marked, the rest afforded the urinary reservoir by a suprapubic opening will give the patient comfort, permit improvement of general nutrition, and conduce in so far as may be possible to an arrest of the local tubercular process. However great the discomfort of a urinary fistula, it is but little when compared with the torture of a tuberculous bladder in an advanced stage.

[1] British Medical Journal, May 14, 1898.

DISCUSSION ON PAPERS OF DRS. HARRIS, MOORE, AND POWERS.

DR. F. S. WATSON, of Boston.

In the main I am in accord with what Dr. Moore has said in the interesting paper we have just had the pleasure of listening to. I don't think I can show to what degree this is the case better than by quoting the view I expressed in 1888, since it has only been confirmed by subsequent experience, and is that which I hold to-day. What I then wrote when speaking of the choice of operative methods, and after having given the anatomical reasons upon which the judgment was based, was as follows:

"Anatomically, two-thirds of all the cases are operable through the perineal incision. Clinically, the perineal operations are the safest.

"The inevitable conclusion from these facts is this. In all cases open the membranous urethra through the perineum, put in the finger, and explore. Twice out of three times you will be able to complete the operation through that incision alone. In the remaining third of the cases, the long perineal distance or the large size or the form of the prostatic enlargement will make the suprapubic operation necessary. When this is the case, proceed to do it at once."

In my opinion, the suprapubic operation should never be done without making the perineal incision as well, and making it, moreover, as the first step in the operation. So doing does not in any way interfere with the immediate subsequent performance of the suprapubic operation, and there is no disadvantage whatever attaching to it. It offers, on the contrary, the following distinct advantages: It obviates the necessity of any previous examinations by the cystoscope, sounds, etc. It permits the more accurate application of instruments to the obstructing portions that are removed in the partial operations, and more rapid enucleation of the lobes *en masse* in total extirpations of the gland, because it affords the opportunity for working with a finger of one hand through the perineal wound from below, and with one of the other hand through the suprapubic incision from above. Finally, it supplies valuable additional drainage.

But although I am, as is Dr. Moore, an advocate of the perineal operations when they can be done, I cannot accept some of the reasons he advances in support of his belief. For example:

He says that the perineal route offers a much better opportunity for accurate dissection and the preservation of the parts, and again, that by it the operation can be performed under the eye, while the suprapubic operation is all in the dark.

I have found, if anything, that the reverse of this is true, if appropriate bladder specula are used. But even if it were true, it ceases to have value as an argument against the high operation as soon as the operator's sense of touch is trained, for the latter is more infallible and of wider application than that of sight, and the actual prostatic part of the operation is, I think, much better done by touch alone than by anything else.

Again, he cites against the suprapubic operation the fact that the distance from the abdominal wound to the prostate is greater than that from the perineum, but this is more than compensated for by the greater space for operative manipulation offered in the high operation; moreover, the distance to the prostate in the latter is not longer, when operating, than it is through the perineal route, because it is reduced by pushing upward the prostate from below and depressing the abdominal wall from above. Measurements taken under other conditions, therefore, do not apply to the actual ones present in operations. It should also be remembered that the distance to the prostate in the high operation varies, of course, according to the form of the hypertrophy in different cases. Accessibility and greater freedom in operating are more significant than distances measured on the cadaver when comparing the upper and lower routes.

The question as to whether it is better to remove the whole or part of the gland is an interesting one.

If we are to believe the advocates of the Bottini operation, in which the gland is only incised and none of it removed, it is obviously unnecessary to do more than incise it in order to obtain admirable results, quite as lasting as those of total extirpation, and the same ought to be more true of the partial operations, in which obstructing portions are actually removed, and if the claims for both of the above are correct, then total removal is unnecessary, and should never be done. But personally I am not persuaded of the truth of their contentions, for in three of my own cases I have seen even small portions of the gland, which I had not removed at operation, subsequently undergo hypertrophy, and become obstructive. And the same fact has been noted by Reginald Harrison, Mansell Moulin, and others.

These observations speak strongly against partial and in favor of total removal of the gland, in cases suitable for it, namely, those in which enucleation can be accomplished.

As to the dangers arising from the lodgement of septic matter in the pouches made in the bladder by suprapubic removal of the gland, and the difficulty of draining the latter, to which Dr. Moore refers, I have never encountered them in my own experience, which would seem to accord also with that of other surgeons, inasmuch as the whole number of deaths from sepsis following the suprapubic operation is surprisingly small.

For example, of twenty-six deaths in 136 operations, only three were due to sepsi.

Lastly, I cannot agree with the statement of Dr. Murphy, quoted by Dr. Moore, namely, that the prolongation from the base of the middle lobe forward into the urethra, which he terms the bridge, does not share in the general hypertrophy of the gland. In thirty specimens which I have just examined with reference to this point, it was markedly hypertrophied, and more or less obstructed in seven. It is interesting to note in this connection, that although this bridge was not hypertrophied in every case in which the middle lobe was enlarged, yet its enlargement never occurred in any case in which there was no hypertrophy of the middle lobe, and in the few instances in which bilateral hypertrophy alone was present there was not the slightest trace of the bridge to be seen. On the other hand, there was no case in which a median enlargement existed in which total absence of it occurred. Mansell Moulin speaks with regard to it as follows: "As it (the middle lobe) increases it spreads backward. . . . Usually, it presses forward into the urethra as well, carrying the very montanum in front of it." Other writers hold the same opinion, and that the failure to deal with it when operating may result in the failure of the operation as well, because of the continued obstruction offered by the bridge, in certain cases where it was originally untouched, and the success which attended its subsequent incision or removal.

Before closing, I want to refer to one or two points in the technique, which I have found useful, or become convinced of the importance of the result of increasing experience, in doing the perineal operation. In the first place, it is quite true, as Dr. Moore has said, that very much larger prostatic masses can be removed through the

perineal incisions than one would suppose possible. For example: Here are the three lobes of the prostate which I recently removed through a median external perineal urethrotomy incision, which was only large enough to admit my forefinger. The largest of the lobes measured two inches in one diameter by an inch and a half in the other, yet it was possible to deliver this large bulk by gentle traction, aided by pressure from behind, with the fingers in the rectum.

The point to which I wish to draw attention is the aid that can be derived from two manœuvres—which were used in connection with the cutting operations for stone nearly as far back as we have any authentic history of them, namely, drawing the prostate down onto the perineum by means of two fingers inserted into the rectum, which can be done in most cases in which the perineal operation is practicable, and fixing it in this position as well as aiding its descent by downward pressure on the abdominal wall above the symphysis pubis. The bladder should, of course, be empty when this is done. I prefer these to the use of a short-beaked sound or other instrument for the same purpose.

Next, I want to call attention to the fact that there is a line of almost natural cleavage in the coverings of the gland, through which it is much easier to reach it, and separate it by enucleation from the capsule than by any other avenue. This line is at the junction of the urethral and bladder surfaces with the lower part of the hypertrophied lateral lobes on either side, and on both sides of the middle lobe.

The finger-tip will be found to penetrate to the gland substance at some point along these lines more readily than elsewhere.

The last point of which I want to speak is with regard to the use of instruments. In partial removals they are needed, of course, but in total enucleations of the lobes all together, or lobe by lobe *en masse*, there is only one instrument needed, and that is the tip of the forefinger and finger-nail. It is the safest, the most discriminating, and exact of all.

With regard to the selection of cases for operation, I wholly agree with Dr. Moore. The operations should be done before the patient has come to a complete breakdown of catheter life, and the keynote of successful results and lessened mortality is the sufficiency of the renal functions when the operations are done.

The practical conclusions from which are these: Operate by the perineum whenever you can by the smallest incision compatible with

removal of the prostatic masses. Use the finger-tip only when enucleating, and in partial operations whatever instrument you can work best with when doing the suprapubic operation, bring the gland within reach by pushing it up from below and pressing down the abdominal wall from above, use one finger of one hand below, and one of the other from above when enucleating.

Reach the gland through the lines of natural cleavage described above. Keep inside the capsule of the gland. If operating through the perineum, bring the gland down by two fingers passed into the rectum, and by pressure downward on the abdominal wall from above the symphysis. When the enucleation has been effected the detached lobe's delivery through the perineal wound if the latter is small and the mass large is facilitated by pressure from behind by two fingers in the rectum. Make the decision as to operating or not depend more upon the evidence of renal sufficiency or the contrary than upon any one other element, inability to lessen suffering in any way other than by operation is the next most important indication. Operate early before renal insufficiency exists when possible.

Dr. N. P. Dandridge, of Cincinnati.

I do not know that I have anything to say in connection with Dr. Harris' paper except that it seems a bold and ingenious operation, which seems to promise a certain measure of relief in a very distressing class of cases.

Dr. Moore's paper brings up a subject of very great interest. The perineum has always seemed to me to be the route to be chosen in approaching the prostate, and after the experience of the last ten years with the various suprapubic operations some form of perineal operation will, I believe, secure the approval of future operators, and the activity now displayed in this field of surgery will doubtless soon work out the necessary details of the operative work.

It may be well, however, for us while discussing the merits of these newer and more aggressive methods not to lose sight of the danger of creating an unreasonable operative furore in prostatic obstruction, and to recall the benefits and advantages of the older, more conservative, and safer methods of treatment employed in the past.

The simple use of the catheter when employed under proper conditions, with proper care of the instrument, has, I am sure, given great satisfaction to every member of this Association, and doubtless everyone can recall cases in which its use has been followed by a long,

active, and comfortable life. I am not unmindful of the dangers of commencing catheter life, with the dangers of sepsis and cystitis, and the possibility of damaged kidneys resenting the regular employment of an instrument. I still think and feel that we ought to emphasize the advantages of the catheter in prostatic cases in a discussion of the merits of mutilating operations, especially when early operations are being so strongly urged as likely to ensure greatly improved results, and believe that the use of the catheter should be the method of choice in the vast majority of cases of prostatic obstruction, and that this should especially be the case when the conditions of life are such that proper care can be assured in its use.

I would further urge the importance of not overlooking the very fortunate results which have followed a simple perineal opening into the bladder in cases of advanced cystitis, followed by drainage for some days or weeks by a tube of large size.

This operation, simple as it is, so rapidly and easily performed, is not, however, devoid of danger, and no inconsiderable percentage of immediate mortality follows its use. I cannot but believe that a much greater mortality must necessarily ensue upon the much more difficult, intricate, and time-consuming operations which are now being proposed. Experience alone will determine whether the increased measure of success will justify the increased danger.

Dr. Powers' case is interesting and important, and he and his patient are certainly to be congratulated upon his success.

I confess that, personally, I have not been able to secure this permanently satisfactory result in draining the bladder by any method. I cannot fix a catheter so that it will not leak, nor can I arrange a suprapubic tube so as to be assured that some urine will not escape by its side.

The suprapubic route I consider the natural and proper way to approach a tubercular bladder when a permanent opening is sought for, but I cannot believe that the admirable results obtained by Dr. Powers will soon become a very general experience.

Dr. J. W. Elliot, of Boston.

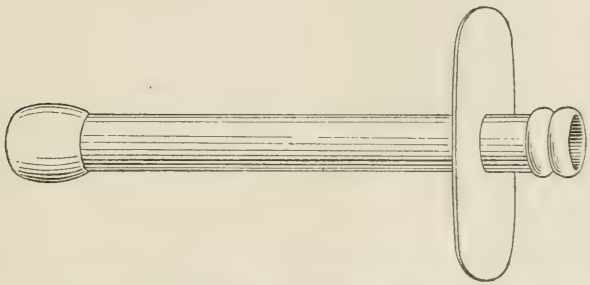
Some years ago I did a number of suprapubic prostatectomies in my hospital service, and in doing so I first tried removing only the middle lobe. I next channelled the prostate, hoping this might be sufficient, and later I removed large portions of the gland. I found all these smaller operations useless. By keeping the suprapubic opening open

I examined the bladder from time to time, and was able to verify the fact that the lateral lobes sink down after these incomplete operations, and the obstruction soon returns. I came to the conclusion that an operation for the cure of prostatic disease must be radical, and that the whole prostate must be removed. This being the case, I found it very difficult by the suprapubic method to get hold of the hypertrophied prostate, which surrounds the prostatic urethra. In certain cases the two lateral lobes were very large, and besides this there was often a thickened mass of prostatic tissue around the prostatic urethra itself. Dr. Alexander's idea of the combined method struck me as important. I tried it, and succeeded for the first time in getting out all the prostate. The patient recovered, and this was by far the best result I had had. Last year I did four cases of perineal and combined prostatectomy, with no deaths, while I had previously had six cases of suprapubic prostatectomy with one death. By the perineal route I feel better satisfied that I can remove all the tissues around the prostatic urethra. There seems to be more bleeding by this route, and it is more difficult to control. In some cases the bleeding was profuse, and required tight packing with gauze. There is no difficulty in the operation itself. On the whole, the perineal route has seemed to me more satisfactory. In one of the suprapubic openings I tore open the peritoneum, but upon recognizing it I sewed it up, with good result. I had one accident in a perineal operation, where the bleeding was very profuse, requiring repeated tight packings. In a few days feces came through the perineal opening, but this healed up quickly and gave no trouble. I think, on the whole, I shall go on doing the perineal operation, especially where the prostatic enlargement is low down.

Dr. John E. Owens, of Chicago.

Some years ago I encountered a case in an old gentleman with stricture of the urethra in which false passages had been made a number of times. A large prostate, chronic cystitis, and chronic inflammation of the kidneys were present. I simply opened the bladder and employed Senn's sigmoid drainage-tube. It occurred to me that the selection of the tube was wise, as it gave great satisfaction to the patient; but as time went on it became obstructed, at short intervals, with phosphates and mucus, so that I was frequently obliged to remove it. The removal was attended with so much pain that chloroform was necessary at each sitting. I devised a tube on the principle of a

tracheotomy tube, which was simply one tube fitting into the other, and the outer tube remained for a long time in the walls.



Outside diameter of bulb, $\frac{7}{16}$; outside diameter of outer tube, $\frac{5}{16}$; inside diameter of outer tube, 7 cm.; length over all, 3, including inner tube; flange, 1½ long; length of tube from flange, ½ inch, including inner tube; length of tube from bulbous end, 2½ inches to flange; length of bulbous point, ⅜ inch.

It was necessary to remove the inner tube from time to time for cleansing. The patient wore this for over a year without the outer tube having been removed, as the family were averse to having it disturbed. A rubber tube was attached to the short projecting piece, and kinking prevented by winding a narrow ribbon of sheet lead around two inches of the proximal end of the rubber tubing. This was fixed to a band running around his body, and thence in a similar manner on the outer aspect of the thigh, the distal end of the rubber tube passing into a small rubber bag. The patient was rarely soiled by the urine, and was able to walk and to travel. I found this tube a great satisfaction to myself and a comfort to the patient. The length of the tube must depend on the thickness of the walls. It should have a small bulb on the inside to prevent it slipping out of the bladder.

Dr. Robert F. Weir, of New York City.

I was much interested in Dr. Harris' paper, having had the experience three times of removing nearly all of the bladder, taking away five-sixths in two of the cases and three-fourths in the other. The first one was in 1894 for a large flat tubercular tumor invading the bladder in two places, and I took away the whole of the anterior and upper parts of the bladder, and also the portion between the ureters down to the prostate. In this case I first learned the ability to peel off the peritoneum from the bladder in its whole extent. It was in this way

I obtained ready access to all the parts without invading the peritoneal cavity.

The second case was one of cancer of the ureters, which required separating, while in the third case the whole base of the bladder was involved. I divided one ureter, but I saved the second with about one-sixth of the bladder, into which the divided ureter was grafted. In removing the bladder I believe a certain portion of the mucous membrane can be saved, in which the ureters may be implanted. In one case the man made a good recovery, and was able, after a year's use of this small receptacle, to hold three or four ounces of water. In the second case, after the grafted ureter was secured and perineal drainage made, there was left quite a raw surface, which was utilized as a pouch for holding the urine. We naturally would endeavor to save all we can. I find no difficulties whatever in separating the bladder all the way round, but in one instance a profuse hemorrhage gave trouble in separating the bladder from the vagina.

As to Dr. Powers' paper on tubercular cystitis, I had a case ten years ago of free bleeding from the bladder. I did a suprapubic operation and found the vesical surface studded with separate miliary deposits. I left the wound wide open, repeatedly packing the bladder with iodoform gauze. The man made a perfect recovery from his difficulty, which continued so during the year or more that I was able to keep track of him.

The last point is in connection with the opening in the perineum for access to the prostate. I have had five cases of removal of the seminal vesicles, and the exposure method of Zuckerkandl for the prostate as well as for the vesicles is very satisfactory. Considerable hemorrhage is liable to be present, but it is easily controlled.

Dr. A. J. Ochsner, of Chicago.

In reference to Dr. Moore's paper I wish to say that up to six months ago I removed the prostate through the suprapubic incision, and did the combined operation, which was exceedingly unsatisfactory. Thanks to the discussions of Doctors Parker, Syms, Alexander, Murphy, and Ferguson, attention has been directed to the real condition. We have to deal with the proper approach to the prostate, which is exceedingly easy. Then there is the question of hemorrhage; but this only occurs from the pudic arteries and the submucous plexus of veins. The pudic arteries may be controlled with ligatures without the least trouble before the prostate is touched. The prostate is very clearly exposed

in this way. By taking a pair of sharp cat's-paw retractors, placing one in the left lobe and drawing downward, a long incision is made through the capsule of the right lobe; then the same thing is done through the left. Thus we have prepared the conditions for an easy enucleation. To avoid injury to the plexus of veins the middle portion is not disturbed until both lateral halves have been enucleated. I have performed this operation nine times since last December. In one of the cases I found that the prostate was extremely adherent because of repeated infections, so that enucleation was not easy. In this case it was removed in small pieces with the use of forceps. By following this plan the hemorrhage is slight until the operation is virtually completed, and packing with gauze will stop it immediately. If this should fail, a few light hæmostatic forceps may be applied and left in place for a few hours.

Dr. Willy Meyer, of New York City.

Permanent drainage for tuberculosis of the bladder with a good result is a rare occurrence. Tuberculosis of the urinary system is descending in the majority of cases. The infection passes through the kidneys. If in these cases the diagnosis is made early and the diseased kidney removed, tuberculosis of the bladder can take care of itself. In many instances local treatment will meet the condition. There are a number of cases, however, where the disease is ascending, where primary tuberculosis of the bladder sets in, and there this operation is indicated in selected cases. As to finding the originally diseased kidney, where both seem to be involved and cystoscopy is unsuccessful, I personally prefer to cut down on them in order to make the diagnosis rather than to primarily open the bladder and watch the mouths of the ureters or catheterize the ureters through the suprapubic wound. These vesical openings in tuberculous patients have a tendency to become permanent. Sometimes we are unable to remove a kidney on account of the low condition of the patient, and such a case occurred to me in 1894. The patient had a primary tuberculosis of the left kidney and secondary tuberculosis of the bladder. The family objected to nephrectomy. Permanent drainage was started, following the thorough cauterization of a large ulceration of the vesical mucosa. The patient lived for six years with comparatively little trouble, but finally died. During the six years I had little trouble to keep him dry. At that time I constructed a special apparatus for the fixation of the permanent catheter, and improved the receptacle for catching the

urine. To keep the catheter in place in cases where the vesical wound has to heal by granulation is quite a task. All the appliances are still unsatisfactory. I believe these pictures which I have brought with me will better demonstrate what I mean to say than a lengthy explanation. Another patient with tuberculosis of the bladder and ascending infection of the urinary system was drained for two years after having had his principally affected kidney removed. I operated upon him in 1898, and he is still comfortable.

In reference to the treatment of prostatic abscess, I think the transverse perineal incision gives the best access. Among many others I have cured two cases of abscess in the prostate without removing the enlarged gland.

In a third case I did perineal prostatectomy after first having evacuated the abscess. The cavity was packed with gauze and the bladder drained through the membranous urethra. Here a rather persistent perineal fistula developed. About nine months later the bladder had to be drained above the pubes on account of insuperable tenesmus. After a few weeks the patient died from an exacerbation of the bilateral suppurative pyelonephritis which had existed before the first operation. I regret not having done epicystotomy simultaneously with excising the prostate. I am sure the patient would have had a much better chance. According to my opinion, the suprapubic incision should be made at the primary operation when extirpating a suppurating enlarged prostate gland.

Dr. J. M. T. Finney, of Baltimore.

It seems strange that so little has been said about Bottini's operation, which, I believe, has only been mentioned once. I have personally had very little experience with the operation myself, but have had occasion to observe it many times as performed by my colleagues. The results of some fifty or more cases will be published later, and I must say that on the basis of Dr. Young's results the Bottini operation is the best one, for the reason that it is simpler by far than any of those referred to this afternoon. Dr. Young's results have been astonishingly good. I confess I have not dared to do the operation myself, in the face of such excellent results as he has obtained; but he has operated on a number of cases for me, not only where there has been trouble with a large middle lobe, but also with the lateral lobes. As to the operation for the removal of the prostate, I have recently operated on two cases through an incision not yet mentioned,

and I chose it because I had not had universally satisfactory results with either the suprapubic or the perineal routes. The whole genito-urinary tract was involved in these cases. The incision was made parallel with Poupart's ligament, as in the operation for ligation of the iliacs. The peritoneum was peeled off the fundus of the bladder; the testicle and the cord were freed down to the seminal vesicles. A perineal incision was then made with the patient in the lithotomy position. The testicle and cord were then passed down from above and brought out through the perineal wound. Traction being made on the cord, the seminal vesicles and prostate were readily removed. This method gave a better exposure than any I have been able to obtain from any other. Both cases made complete recoveries.

Dr. Emmet Rixford, of San Francisco, Cal.

I would like to refer to the work of Dr. George Goodfellow, of San Francisco, who removed the hypertrophied prostate by the perineal route in 1891, and developed a definite technique for the operation. He has since reported some twenty or twenty-five cases so treated, and with uniformly gratifying results, the obstruction being satisfactorily removed and control of the urine maintained. He removes the gland through a small median incision, as in median lithotomy, but insists on two points in the technique as being of special importance, viz., maintenance of the patient in an exaggerated lithotomy position, with thighs forcibly flexed on the abdomen, firm pressure being made on the suprapubic region by the operator's free hand, by which manœuvre the prostate is driven down well within reach of the finger; and, secondly, he insists on splitting the prostate with the knife entering the bladder, by which the whole of the interior of the bladder may be reached by the exploring finger, stone, if present, removed, or median lobe torn away. The lateral portions of the gland are readily enucleated by the finger passing just inside the capsule. The hemorrhage is insignificant. Drainage is made for a few days by a tube passed into the bladder. Dr. Goodfellow permits his patients to get up as soon as they feel like it, even after two or three days. Personally, I have removed the prostate in this way in two cases, and was surprised to see how readily the enucleation was accomplished.

Referring to the Zuckerkandl incision in the perineum, I would say that I had occasion to employ it in removing the seminal vesicles and prostate for tuberculosis, and found it to give abundance of room,

giving ready access to the region and permitting any part or all of the prostate to be dissected out under the eye. In the case referred to I removed some two inches of the vas deferens on each side in addition, without opening the peritoneum. The patient made a slow but satisfactory recovery, but it is too soon to make any statement as to result.

Dr. Robert Abbe, of New York City.

There are occasional cases in which it is wrong to do a prostatectomy, as the risk of operating on old men is too great to do a long operation. In these cases we should do suprapubic drainage, and I have resorted to this much more often than the radical operation. I have one patient who keeps himself perfectly dry, although carrying a suprapubic drainage for six years. An advantage is that the operation may be done under cocaine. The wall of the bladder is raised, and one essential is to put a purse-string suture around the opening in the bladder to tie the catheter tightly in, and insert the included part of the mucous membrane. The ends of these strings (heavy catgut) are left long and tied around a safety-pin, transfixing the rubber tube at the level of the skin, thus preventing the tube from slipping out. The bladder wall is thus left inverted, and the wound will close as soon as you take the catheter out. As to an adequate receptacle to use in these cases, I prefer a rubber bag with the neck tied tight around a glass pipette. The tape which ties it is left long enough to fasten it to the waist, and every day it is partly filled with boric-acid solution. You may have it one-half full if you wish, and you can wash the bladder out freely with this. The whole thing is in the patient's hands. The boric-acid solution keeps the patient's bladder sweet. The patient can lie in bed and the urine will be adequately drawn off.

Dr. Moore. I am glad to have introduced the subject, and I did not expect to tell anybody anything that they did not know. We will all admit that in the past we have looked upon prostatectomies with a great deal of discomfort. We did them suprapubically, but did not like them. They were bloody, and we put them off as long as possible. The experiences mentioned to-day simply illustrate the growth of this operation. Dr. Elliott has tried doing both ways at once, and has decided that the perineal route is sufficient. I am sure every man's experience will agree with mine. Like Dr. Ochsner, I was sur-

prised to see the prostate come into view so easily. Dr. Ransohoff speaks of the lack of space through the incision; but this seems to me sufficient. The testimony shows that the operation may be performed in more than one way. The objections that each one of us have had to the operation have been purely theoretical. Dr. Ransohoff states that he has made a curved incision so as to give him a good view of the prostate, but I have never had any trouble in getting plenty of room. It has been shown that the distance from the surface of the prostate is much less by the perineal route, and the prostate is enlarged one half as far from the surface of the perineal route as the other.

Dr. Finney speaks of the Bottini operation, to which I referred in my paper, but I believe we can get our technique so perfect that we can do away with palliative operations such as this is. In reference to this matter, I would state that we shall certainly do this operation more as we grow in experience. I had one case, fifty years of age, who wanted to be a father again. He already had one son, and I believe I succeeded in accommodating him. I removed only a part of the lobe, and he had still one testicle, which I believe is doing business. I will show a specimen with a pair of lateral lobes and also with a small upper lobe upon which I operated post-mortem. It illustrates the feasibility of dissecting the rectum. I make an incision into the capsule, keeping my retractors within the capsule, and you can turn it out with your finger. You are able to dissect the lateral lobe without going into the urethra. The upper lobe is attached very lightly to the lateral lobe, and can be peeled out very easily, which illustrates a difficult point in the technique. When you cut across your capsule there is a point where you need to take the point of a plain scissors and assist yourself just a little. Here is a strong bladder wall. I have never had any difficulty in getting a hole through the rectum. With a Sims speculum and an anterior retractor inside of the capsule you will be surprised at the facility of dissecting up the colon.

These specimens were taken from a man ninety years old. He had some bladder symptoms, but did not die from that. It is evident that he had a very hard prostate, and gives some idea of the conditions of those who have acute bladder symptoms. We found a good, healthy bladder wall, and the rectum was easily separated. Both ureters were intact, and the vesiculæ seminales were normal. Enucleation was easily performed at the post-mortem.

THE TEACHING OF SURGERY.

By HERBERT L. BURRELL, M.D.,
BOSTON.

The subject of the teaching of surgery is one in which I have been keenly interested for many years, and the more I study it the less definite my conclusions become. There are undoubtedly underlying principles which govern the teaching of surgery, but what those principles are I have not yet determined. The vagueness of my impressions and the lack of positive conclusions led me at first to decline the invitation extended by the President and Secretary to present a paper on this subject; but, impressed as I am with the importance of the subject, I decided to give such opinions as I have, with the hope that they will stimulate discussion, and thus be made a step in progress toward the solution of the problem, What constitute the best methods of teaching surgery?

I think we all appreciate that our impressions and conclusions as to methods of education are at present being revised; whether wisely or not time alone can tell, for it is only by experience that the value of methods of teaching can be determined.

My experience as a teacher of surgery has covered too short a period for me to see the end-results of methods, and it has been too limited in time and methods for me to speak with authority. I am entirely convinced that the method of teaching adopted by an individual teacher is to him the most effective. Individual pupils will select one method, others will prefer another. Some will develop rapidly, others slowly. Some prefer to do their work spasmodically, lying fallow at times, while others prefer to work systematically. All of this makes it important that there should be a number of different methods for studying surgery.

Methods are incidental to the teaching of surgery. What should be required and given to pupils in surgery are:

First. The minimum required fundamental knowledge.

Second. The maximum opportunity to acquire knowledge by personal contact with cases.

Third. Atmosphere and enthusiasm—which mean environment and men.

I shall take up the following methods of teaching surgery which are in more or less common use, and shall consider certain subjects that are co-ordinate with teaching surgery:

1. Didactic lectures. 2. Recitations. 3. Surgical anatomy. 4. Surgical physiology. 5. Surgical pathology. 6. Surgical technique. 7. Physical diagnosis. 8. Demonstrations of clinical material to (*a*) large classes; (*b*) sections; (*c*) ward visits. 9. (*a*) Conferences; (*b*) reports of cases; (*c*) surgical tutors. 10. Diagnosis clinics. 11. Out-patient and bedside work. 12. Case teaching. 13. Operative surgery—(*a*) cadaver; (*b*) animals. 14. Original work. 15. Hospitals. 16. Dispensaries. 17. Organization. 18. Association and co-operation of departments.

In January, 1901, the following circular letter, in English, French, and German, was sent to the different medical schools in the world:

22 NEWBURY ST., BOSTON, MASS., U. S. A.

MY DEAR SIR: I am desirious of obtaining information regarding the teaching of surgery in the various medical centres. Will you be good enough to answer the following questions as far as practicable?

Any information that you may give me will be used to improve the teaching of surgery in Harvard University.

Very truly yours,

HERBERT L. BURRELL,
Assistant Professor of Surgery, Harvard University.

To.....

1. What is your corps of instructors in the department of surgery, and about what is the proportion of instructors to students?
2. What is the entire time (in hours) given to instruction in surgery?
3. What are the approximate gross expenses in the department of surgery?
4. How is the instruction divided in time, under the following heads?
   (*a*) Lectures.
   (*b*) Recitations.
   (*c*) Demonstrations.
   (*d*) Clinical instruction.
   (*e*) Laboratory work.
   (*f*) Sections of students.
5. What, if any, text-book or text-books do you use?
6. What is the amount of required,[1] elective,[2] and optional[3] work (in hours) in surgery?
7. Briefly describe your method of teaching (*a*) operative surgery, (*b*) surgical technique.
8. What opportunity is afforded special students to do original work in surgery?
9. What teaching relation exists between the department of surgery and that of gynecology, syphilis, genito-urinary surgery, orthopedic surgery, otology, or ophthalmology?
10. What number of (*a*) bed and (*b*) walking surgical patients are available for use in your school?

11. What number of (*a*) bed and (*b*) walking surgical patients are directly under the control of your school?

12. Briefly describe your method of examinations and your system of marking?

13. Is any special instruction given in the pathology of surgical diseases? If so, is any laboratory course given in connection with it, and what is the number of hours for such instruction?

14. Is there a laboratory course, required,[1] elective,[2] or optional,[3] in surgical anatomy, and what is the character and scope of the instruction given?

REMARKS.

I received replies from approximately 80 per cent. of those addressed. In the majority of cases the information received was interesting, suggestive, and valuable, but the questions were not answered.

I sent this letter with the desire to benefit the teaching in Harvard, and while the replies could not intelligently be used statistically, yet their value to me individually was inestimable in that my opinions were modified, controlled, and occasionally changed by the mass of information.

I shall try to give you the impressions I have formed.

1. *Lectures.* The advantages of systematic or didactic lectures are economy in the teacher's time in presenting a subject to a large body of men, economy in the student's time in having a subject predigested, the essentials and non-essentials pointed out by a man of ripe experience, and the inspiration that comes from the "spoken word."

The disadvantages are: The receptive condition of the student and his not being forced to acquire knowledge; the danger of lectures becoming perfunctory from lack of competition in that usually one man gives them; the fact that there are but very few good lecturers and the lack of stimulus to the teacher in lecturing, for he gives out and does not receive.

The lecture which simply gives the knowledge that can be readily obtained in a text-book is a waste of time for both teacher and student. The lecture which is critical, analytical, which presents new knowledge and awakens in the student a latent enthusiasm for work, is rare but of great value.

The present fashion is to condemn the lecture, but it has a place, and will always be given in some form.

It would be unwise and impossible to cover the whole field of surgery in a course of lectures, but selected subjects can be given to great

[1] Required work is necessary for a degree.
[2] Elective work *may* count for a degree.
[3] Optional work does not count for a degree.

advantage to teacher and student. A syllabus of the whole of surgery should be prepared for the students and printed. By means of this syllabus the teacher can point out the knowledge that they should possess.

A system which has been used for a number of years at Harvard has advantages. Lectures are given on the afternoons of Monday and Wednesday, and on the mornings of Tuesday and Thursday the clinical material is massed at the two great hospitals, illustrating the subject of these lectures. These exercises in turn are followed by a recitation on the subject of the lectures and clinics. The student thus receives and acquires knowledge on the individual subject from a number of different standpoints.

The demonstrations of surgical specimens to illustrate the systematic lectures is time-honored. The custom has been to describe to the student what the lecturer sees in a specimen, then to pass it around and to proceed with his lecture. By the time the specimen has reached the middle of the class the lecturer is speaking of some entirely different subject.

For a number of years at Harvard the lectures have been given, and at the end of every second or third exercise the students are taken into the museum, and at different tables the instructors demonstrate the specimens illustrating the preceding lectures. This works fairly well.

In general it may be said that in the smaller schools, which lack clinical material, lectures predominate. Unless they are illustrated by clinical material they are an acknowledgment that the school is not strong.

To summarize: Lectures are of value if illustrated by lantern-slides, charts, diagrams, specimens, and clinics, and if there is a good lecturer.

2. *Recitations.* The recitation has of late been out of fashion, but it seems to me a most valuable exercise. The student in this exercise takes the active part, and is no longer simply receptive; he can summarize his knowledge, test its scope and value, and the teacher can find out what knowledge has been acquired, explain mooted questions, and clear up obscure points. Perhaps the most valuable part of the exercise is the facility it gives the students to ask questions.

Sarcasm on the part of the teacher is effective as a means of driving home a point, but its chilling effect on the body of students is marked. If the student hesitates in replying to a question, the whole class may be kept on the alert by putting the question to "anyone" in the whole class or selecting any individual student to answer.

A method which is in use at Harvard is as follows: Three teachers assemble with the students, one having prepared a list of important questions to be asked from the two or three preceding lectures. One calls the roll, another asks the questions, and the third teacher stands at the blackboard, and as the question is asked the salient points of the answer are written on the board as the students bring them out. This serves to emphasize the important things to be remembered. At times the teachers differ in their opinions, for example, in reference to abdominal drainage, and an informal discussion ensues between the students and teachers, one with the other. The result is a thoroughly enjoyable exercise to both students and teachers.

The subject of the recitation should be that of the preceding lectures or the syllabus, and the student may use any text-book.

Summary: Recitations are of value to both student and teacher if they are made a means of clearing up vague or mooted points, and they serve to summarize the student's information—that is, they make him explicit in that he himself must put his knowledge into words.

3. *Surgical Anatomy.* This is a subject of great importance, as it forms one of the foundation-stones on which a thorough knowledge of surgery should rest. The modern laboratory anatomist is not competent to teach surgical anatomy. The actual anatomical needs of the surgeon are best presented by one familiar with surgery.

In Lausanne, in the University of Minnesota, in St. Louis, in the College of Physicians and Surgeons, New York; in Syracuse, in Erlangen, in Prague, under Beyer and under Wollfler; in Krakow, under Trzebicky; in Canada, under Bell and Armstrong; in Sheffield, under Pye-Smith, and in Aberdeen, under Ogston, there is no surgical anatomy taught except that given by anatomists.

In Copenhagen, under Plum; in Padua, under Bassini; in Genoa, under Morisani; in Strasburg, under Madelung; in Cincinnati, under Dandridge; in Heidelberg, under Czerny; in Bristol, under Swain, and in Birmingham, under Barling, there are excellent courses in surgical anatomy, which are mostly elective or optional.

In the University of Liege, Winniwarter, the professor of surgery teaches surgical anatomy; in Rome, Occhini makes a very strong point of having surgical anatomy taught apart from anatomy. At Ann Arbor there is a course in surgical anatomy, also at the University of Pennsylvania and at Cornell. At the Western Reserve, under Allen, there are excellent demonstration courses in anatomy, and at Stockholm, under Akerman and Berg, there is an excellent system, which should be imitated—that of conducting the operative surgery on the cadaver to illustrate surgical anatomy. At Harvard, Richard-

son gives an admirable optional course. Dwight, professor of anatomy, who was formerly a surgeon, gives an excellent course in topographical anatomy.

Provision should be made for the teaching of surgical anatomy of the chest and abdomen at the autopsy-table. The relative position of the organs, their color and consistency, can, with great advantage to the students, be taught at an autopsy-table. I believe that surgical anatomy should be taught by men who have had surgical experience. The work should be done in small classes, under instructors; demonstrations should be made by the professor and repeated by the classes.

4. *Surgical Physiology.* The work which Horsley and Macewen did in physiological research as applied to surgery was of great value. Methods of physiological research have been strangely neglected—in fact, overshadowed—by surgical anatomy and surgical pathology. There has not been until recently a thorough training of men in physiology, and this knowledge has never been sufficiently applied to clinical problems.

Of late the brilliant work of Crile and Harvey Cushing has given an impetus to methods of physiological research. In the future it may be necessary to give additional instruction in the principles of physiology which are applicable to surgery. The same may be said in the future of physiological chemistry.

5. *Surgical Pathology.* This is another foundation-stone on which the knowledge of surgery should rest. Every student, after acquiring a knowledge of pathology, should be obliged to study the pathology of injury, infection, and repair, and the course should give the fine and gross pathological conditions in the various tissues. The course given at Harvard by Dr. Nichols, which I illustrate, has been of great advantage to students in laying the foundation of the principles of surgery. The students are shown, in a laboratory, sections from a rabbit's ear and from human skin healing at the end of the first, third, fifth, seventh, tenth days, etc. On the following day, or on the preceding morning, they are shown the same processes going on in the living human being. By a succession of similar exercises they are carried through the various injuries to the individual tissues throughout the body, and at the end of a month they possess a sound foundation-knowledge of surgical pathology.

The study of surgical pathology should not be confined to the histological changes which are seen under the microscope; it is of equal, if not of greater, importance that a course in surgical pathology should be given which covers the gross pathological changes. These are the conditions which are continually presented to the surgeon, which he

is obliged to interpret, and if his instruction has continually correlated his gross and fine pathology he is properly equipped.

This instruction in gross surgical pathology should be given as an elective course later in the curriculum. An excellent course can with advantage be given in any school on the gross and microscopical examination of tumors.

The custom of definitely considering the surgical pathology of each individual case is more common in Germany than with us. In many places in this country and abroad there is no special course in surgical pathology. So far as I can ascertain there is no surgical pathology, as such, at Lausanne, Stockholm, Prague, or in several of the larger schools of this country.

In Padua, under Bassini, there is a special course given, which is elective, with demonstrations. In Canada, under Bell and Armstrong, an excellent course is given in the demonstration of surgical pathological specimens from patients previously shown at clinics. There is, however, no special course in surgical pathology. In Krakow, surgical pathological demonstrations are given by *privat docents*. In Heidelberg, under Czerny, surgical pathology is given by *privat docents*, with laboratory work.

In Copenhagen, under Plum, an excellent systematic course in surgical pathology is given. In Sheffield and Birmingham, surgical pathology is taught systematically. In Chicago, under Holmes, a special course is given. In Cincinnati, under Dandridge, a sixty-hour course is given in surgical pathology and the examination of tumors. Excellent courses are given at the University of Minnesota, at the Western Reserve, and at Ann Arbor. A capital optional course, on the examination of tumors, is given at Harvard by Dr. William F. Whitney.

The study of surgical pathology is of such importance that, although it seems obvious that a minimum required course of instruction should be given in this subject as well as in others, in addition teachers of surgery should be so well grounded in the subject that they can by their instruction carry the teaching of surgical pathology throughout the whole curriculum.

6. *Surgical Technique.* This course usually means the application of bandages and surgical apparatus. It should be expanded to cover a larger field. The bandaging of wooden legs is relatively of but little value compared to the bandaging of living models. The use of gauze bandages has largely done away with the complex bandages which were commonly in use twenty years ago. But there are times when a practitioner can control a spreading infection on an arm by skilful application of a roller bandage. The art of bandaging should be

taught, and not be lost. In this course the student should be taught to do an aseptic dressing upon a living model—*e. g.*, two students may be made to change the dressing upon a supposed abdominal operation upon a living model. They can be made to sterilize the material and to go through the operation of changing a dressing with the same care they would exercise on an actual case. They should be taught the various ways of making a bed, of feeding patients, of passing bed-pans and urinals, and the administration of enemata. In short, they should be taught many of the details by which surgical patients are made comfortable which at present are frequently relegated to a nurse.

In such a course the student should be taught how to use the ordinary implements of a carpenter's bench; he should know how to saw, he should know how to make a wooden splint, and how to make a tin or aluminum splint. The various non-operative technical measures can in this way be taught on models and carried out by the student before he comes in contact with the patient, and he will then be fitted to do his out-patient and ward work.

In the majority of places surgical technique is taught in the wards or out-patient departments upon a patient, and, while this method has very definite advantages, I believe the preliminary drill upon models is a distinct addition. Excellent courses are given in Philadelphia, New York, Ann Arbor, Cleveland, and in other places.

7. *Physical Diagnosis.* At about the same time that the student is taught surgical technique he should be taught, on living models, the methods of examining patients from a surgical point of view. The course should be co-ordinate and supplementary to that given on auscultation and percussion, or physical diagnosis as given by medical instructors. The various anatomical landmarks can in this way be emphasized; the method of examining a fracture (for example, abnormal mobility and crepitus) should be taught on the fractured thigh of a dead dog rather than upon a human being; fluctuation, the examination of cavities—mouth, rectum, etc.—can by means of such a diagnosis course be taught on living models rather than upon patients. The students should be taught in sections and shown how they can easily acquire knowledge. In this way they can be fitted to enter an out-patient department or the wards of a hospital and be of real value as assistants.

8. *Demonstrations of Operative and Clinical Material.* (*a*) *Operating clinics:* The student sees the best operators, but is not sufficiently near to see the operation. I question whether they are of much specific value apart from familiarizing the student with the customs and habits of operators.

(*b*) *Massing material:* A very instructive method of presenting cases, especially if used in connection with lectures and recitations—for example, to show to a class of students a series of cases illustrating the various stages of cancer of the breast or diseases of the knee-joint, including the end-results of operations—is of incalculable value. In fact, at times such valuable material is collected that it makes a most instructive investigation to the instructor. The use of lantern slides to supplement stages of disease in a clinic is of value, but they are more appropriately used in connection with a lecture.

(*c*) *Section work:* The value of section work is very great. The closer that one reaches the ideal of individual instruction the better; the great advantage of small sections is that the instructor can give to the student the *opportunity to acquire knowledge.* Section work should be confined to classes of not more than twenty men, and in this manner the student is brought very close to the instructor.

(*d*) *Ward visits:* These still take place in many places, and the "walking the wards" of a hospital is time-honored. The actual value of a ward visit is very slight, particularly if a section of more than ten men accompanies the surgeon. The listening to a description of what has taken place, and seeing the results of operations from the outside of bandages, does not constitute instruction.

The German system of amphitheatre clinics given by the professor connected with a university under State support is very widely in use everywhere. It has very definite advantages, but it does not equal the system of small sections taught by individual instructors. It, however, will always maintain as an economical system of instruction in which there is an appeal to the dramatic sense of both teacher and student.

Wherever it is practicable and there are enough clinical material and a sufficient number of instructors small sections are very desirable. In a few places almost individual instruction is given, but this is where there are small classes of students and a large number of instructors.

9. *Conferences.* (*a*) The conventional conference; (*b*) reports of cases; (*c*) surgical tutors.

(*a*) The conventional conference, which is elaborated by the student after the fashion of a French thesis, is of real value to the student in that he is trained in research in medical literature. The student should be given a case, should present a complete history and physical examination, should give the literature of the subject, should draw his deductions, and they should be criticised by his fellow-students and the instructor. Frequently conferences are conducted in such a

manner that they are of but little value to the student, for often students prefer to have the mature opinion of the instructor rather than the immature opinion of their classmates.

(*b*) The reports of surgical cases are of value, particularly if they are carefully criticised as themes. In Montreal, under Bell and Armstrong, each student reports at least ten cases, and in Stockholm case-instruction forms a very important part of surgical instruction.

(*c*) Surgical tutors. A number of surgical tutors would be of real value to a school. They should be relatively young men who are close in years to the students. One of the principal defects in practically all the schools in this country, so far as I know, except the Johns Hopkins and possibly Ann Arbor, is the absence of personal interest in the individual student. The student should have someone to whom he can go at practically any time to talk with about his work. A spirit of comradeship should be established between instructors and students, which would be of great value to both. The closer the intimacy between student and teacher the more likely the teacher is to know the defects of his teaching, and the student can, by informal conferences with his instructor, obtain not alone knowledge, but inspiration for his work. I have been impressed at Johns Hopkins with the feeling students have that they are an integral part of the school and hospital. I dare say it exists in other places, but it has not been my fortune to see it. I would suggest, where there is a large number of instructors, that during the third and fourth years the students be assigned to tutors. It would not be burdensome to the instructors; in fact it would be enjoyable for them to be brought in contact with bright minds.

10. *Diagnosis Clinics.* These are of a good deal of value if conducted before a whole class, and better before small sections. To place the student before a case, to have him extract the information from a patient, and, although at times this is done clumsily, it is of real value both to the individual student and to his classmates, for we learn more by our blunders than by our successes, and if we are intelligent we learn by the blunders of others. The elaborate eliminative diagnosis which is used by many instructors is at times unnecessarily cumbersome. It is frequently of great value to bring before students a case in which the diagnosis cannot be made, and to have them work out, by asking questions and making suggestions, the fact that a diagnosis cannot be made. This teaches them that every patient cannot be dubbed with the name of a disease.

11. *Out-patient Work and Indoor Work.* To the average student this is the most valuable method of instruction he can receive. To

actually do the work himself is a keen desire on the part of every student, and is the best way of acquiring knowledge; but in justice to patients no student should be allowed to undertake this work until he has been thoroughly drilled in surgical pathology, surgical anatomy, and surgical technique. He can then intelligently benefit by coming in contact with patients. Frequently the student is allowed to go into an out-patient department too early in his career; for instance, he is utilized or allowed to put on a plaster-of-Paris bandage when he does not appreciate the processes of repair which are going on in a fracture. This is almost a waste of his time, and gives him an improper standard of work. If a student is properly trained prior to his entering an out-patient department or the wards of a hospital there can be no valid objection on the part of trustees of hospitals to his working in the hospital. Students can then be of real value to an out-patient department or the wards of a hospital, in case-taking, in establishing surgical diagnoses, and in the treatment of patients. It is, however, imperative that they should have received sound preliminary training in surgical pathology and surgical technique before they are allowed to treat the case. Individual responsibility is best developed by exercising this function. There are few people who will not rise to responsibility when it is given them. They are at times indiscreet, and occasionally have to be checked or spurred on to their opportunities. Students are best developed by being individually brought into contact with patients and made responsible for their care and treatment. It is often said that this method is impracticable, because boards of managers of hospitals will not allow it to be done. They will allow it to be done if they are reasonable and if the student is under supervision. One has only to compare the care given patients in a well-conducted out-patient department, with intelligent students as assistants, to the care which is given patients in an out-patient department where there are no skilled assistants. This is the crowning part of a student's knowledge, and should be acquired last. In medicine the student can do but little harm; in surgery he may do serious injury to the patient unless he is under supervision and has a sound fundamental knowledge.

By law the German student must work two semesters, and the Austrian must work four semesters, as a *prakticant*—that is, attend clinics and see and care for cases.

At Lausanne the students do the etherization and go into wards. At Liege they serve as student dressers, later as chefs de clinics, then as graduate assistants.

In Montreal the students do some assisting, but I believe are not

compulsory dressers. In Stockholm there is a strong system, where the students act directly as the hospital corps, in a more direct manner than in Germany. In fact, the instruction is rigidly clinical.

At Birmingham they have compulsory dresserships, where students serve for nine months. In Kiel, under Helferich, dresserships of two to three months are open to students. With Czerny, dresserships in the house are open six to eight weeks. At Johns Hopkins every student serves as a dresser or clerk in both the out-patient department and wards.

At the larger American schools students voluntarily act as dressers in the out-patient departments and occasionally in the wards.

Every student should serve as a dresser in an out-patient department for at least two months, and as a clerk and dresser in the wards of a hospital for two months.

12. *Case Teaching.* The method proposed by Dr. Cannon ("The Case Method of Teaching Systematic Medicine," *Boston Medical and Surgical Journal*, January 11, 1900; and "The Case System in Medicine," *Boston Medical and Surgical Journal*, May 31, 1900) I have used, and it has been particularly employed by Dr. Charles H. Frazier, of Philadelphia ("The Case Method of Teaching," *University of Pennsylvania Medical Bulletin*, September, 1901).

I am much impressed with its value as a method of teaching, for it makes the student think. The students are given not a hypothetical case, but the history of an actual one, and are expected to write out, or what is preferable, to discuss at a subsequent exercise the diagnosis, prognosis, and treatment of the case. It has been of special value this winter, where at times the clinical material has been limited, owing to an epidemic of smallpox. It would be of special value in the smaller schools, which lack clinical material.

During this past year my friend, Dr. John Bapst Blake, has taken up the case method of teaching in surgery. I have asked him to summarize his experience, which he has done as follows:

"THE ADVANTAGES AND LIMITATIONS OF THE CASE METHOD OF SURGERY.

"The case method originated for practical purposes in the Harvard Law School. When applied to surgery it has distinct and obvious limits. Within these limits, however, its advantages are many and its possibilities well-nigh endless.

"Its limits are (1) that it presupposes a fair knowledge of the symptom-complex of surgical disease, using the term in its widest sense; (2) that it takes for granted previous instruction in physical examination of patients.

"Its advantages are (1) that it utilizes all patients, past and present, hospital or private, for clinical material. No case is too sick or too simple to be utilized for the case method. (2) It gives opportunity for the discussion of the relative value of symptoms, the differential diagnosis, the prognosis, the treatment, operative or non-operative, in the

smallest detail; it offers problems relating to private patients and to atypical conditions; it exercises the sense of responsibility by making the student directly answerable for statements and opinions in definite conditions; it affords excellent practice for examinations, many of which present questions in the precise form given in the case method. Finally, in almost every case the completed history and the autopsy perhaps can be given to the class, after the discussion is finished and the students are on record as to diagnosis, prognosis, and treatment. In brief, it presents the practical problem which faces every practitioner, in the person of every patient, as soon as the latter has given his family and personal history and the former has made his physical examination."

13. *Operative Surgery.* This should be conducted (*a*) upon cadavers; (*b*) upon animals. (*a*) Cadavers. The inestimable value of operative surgery upon cadavers is thoroughly recognized. The operation, illustrated by diagrams, should be demonstrated by an instructor to groups of eight or ten students, and the students should then repeat the operation upon the cadaver. The course should then be conducted at leisure, and, as the operation is finished, the student should be questioned as to the surgical anatomy of the operated parts, as to the indications for operation, and the care and after-treatment of the operation wound.

(*b*) Animals. The importance of operative surgery upon animals has not been sufficiently recognized. A dog, for example, can be anæsthetized, hemorrhage demonstrated, abdominal and thoracic operations can be done, and wounds sutured. Every student should have an opportunity of doing intestinal resection upon an anæsthetized living animal. In this way we can protect human beings from the novice who may be called to do an intestinal resection for a gunshot wound of the abdomen; he could then undertake such an operation with the experience of having done the operation previously upon animals. The animal should be killed at the completion of the operation.

To quote from Dr. John S. Billings' paper on "Methods of Teaching Surgery," delivered before this Society in 1894 (TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION, 1894, vol. xii., p. 86), he states "as for operating technique, much of it can be learned on animals, but much of it requires work also on the cadaver, the repetition over and over again, until, as Billroth said, a man could do it when he is asleep."

In Germany, operative surgery forms a very important part of the instruction. A great deal of operating is done on the cadaver by the average German student, and there is plenty of material.

In Italy, Occhini has done a good deal of operative surgery upon animals. In Stockholm operative surgery is optional. At Ann Arbor, the Western Reserve, and the University of Minnesota there is operative surgery on both the cadaver and dogs.

14. *Original Work.* Men capable of doing this class of work are rare. To require students to do this work is unnecessary and unwise; but if any student shows a capacity for original work, whether it be the study of the behavior of a cell, or an effort to establish a new principle in surgery, he should be given an opportunity to carry out his work.

There is at present a wave of interest in original work. One would suppose that it is the touchstone which is to solve the riddle of the universe. The custom of assigning to students an "Arbeit," to be worked out or solved is a valuable method of training, but very rarely will a student contribute anything of great value to surgery. However, this training may be far-reaching in its effect, in that we may develop or inspire a future John Hunter; so that we should encourage this effort to do original work, but strictly under guidance.

Occhini, in Rome, gives experimental work and many animal experiments to his students. Opportunities for doing original work exist in many places, although they are rarely utilized. Naturally, this work should be done toward the end of the course in medicine.

In order to carry these various details of teaching into effect it is necessary that there should be hospitals and dispensaries.

15. *Hospitals.* It is of vital importance to a medical school that it should have a hospital under its control, or rather that it should be able to place its teachers in the hospital. Control of a hospital enables a medical school to call a professor of distinguished attainments from any place it may desire. This is an inestimable advantage. In many places, at the present time, surgeons who hold clinical material can practically dictate their terms to a medical school. They may be good, bad, or indifferent instructors, but their clinical material is necessary, and the men must be appointed to secure the clinical opportunities for students. This is an entirely wrong principle upon which to run a medical school. The school should control a hospital rather than have a hospital control the school.

There should be one or more continuous services in charge of a professor of surgery, who should have the appointing or nominating of assistants. These assistants, with the exception of men in the first grade of rank, should not be permanent officers, but should be changed from time to time. The clinical material should be under the control of the surgeon-in-chief, and should be used by him (1) for the benefit of the patient; (2) for the advancement of the knowledge of surgery; (3) for the teaching of undergraduates and graduates.

The size of the hospital is not of such great importance, for the quality of the cases is, from a teaching standpoint, more important

than the quantity, and a good teacher can do more efficient teaching with poor material than a poor teacher can with a wealth of material. The judicious management of cases, to secure their highest value to the largest number of students, is of especial importance. Students should have free access to the wards of a hospital, under supervision. Practically, the care of the patients in a hospital connected with a school should be carried out by students under the direction and supervision of a teaching force—in fact, if a proper system exists, students can be made of the greatest possible value to the patients and to the hospital.

An excellent example of the value of a hospital being under the control of a medical school is at the Johns Hopkins. The use of material from hospitals not under the control of a school in large medical centres is a matter of importance, for the reason that the moral support of a hospital not connected with a school is of great value, and it is of importance that the students should receive instruction from many men of many minds.

16. *Dispensaries.* An extraordinary amount of valuable material exists in well-conducted dispensaries. These can and should be in charge of a medical school. They are relatively inexpensive when compared with the enormous expense of running a hospital, and any medical school should carefully consider the burden it assumes before undertaking to run a hospital. The mass of valuable clinical and pathological material which comes to a dispensary should be in charge of a surgeon connected with the school, and it should be utilized for instruction and for research.

The Cornell Medical School has recognized the value of the dispensary, and is utilizing ambulatory material to a large extent. In various parts of the world the mass of surgical material which is not utilized either for instruction or for advancing the knowledge of surgery is enormous, and this is to be deeply regretted. A hospital or dispensary appointment carries with it a responsibility beyond the care of the individual patients. The incumbent of such a position is especially chosen from many competitors, presumably upon merit, and he owes a duty to the position he holds. He should not be allowed to rest content by assuming that his duty is done if he does his routine work; he should be held to the responsibility of his opportunity, which is contributing to the advance of surgery or teaching.

17. *Organization.* To carry out these various methods of teaching surgery it is necessary that there should be organization. A medical school may have the finest equipment, the greatest clinical and laboratory facilities, and yet fail, by a lack of organization, to accomplish

the greatest good. A school depends upon the men who are its teachers. They are its integral strength, and upon them rests the measure of success.

The organization should be simple. There should be one or more professors, together with associate professors, lecturers, instructors, and assistants. The professors should be members of the Faculty. The professors, instructors, assistants, and clinical professors or lecturers, if they exist, should constitute a department of surgery. In this department of surgery should exist genito-urinary surgery, orthopedics, gynecology, laryngology, otology, and ophthalmology. Any or all of these subdepartments may have professors or associate professors.

Up to the present time, with notably few exceptions, clinical teachers have not been compensated for their work in medical schools. It has been tacitly understood that the prestige of their position would give them consulting practice, and by this means they would be able to gain not only a livelihood, but also a competency. This assumption that a position in a medical school will give a man a competency by consulting practice is no longer true. This is an indirect method of payment at best, and is not desirable.

Surgery will never advance as its sister subjects in laboratories have advanced until a sufficient amount of money is paid to surgeons to teach surgery and to make it the principal object of their lives. If this principle were established in this country, surgeons could be called from place to place and the best teachers commanded—a most desirable and much-to-be-hoped-for condition. Much money is and has been devoted to the erection of monumental structures in connection with medical schools. What should appeal to generous givers who wish to benefit mankind is the establishment of foundations by which clinical men can be paid for the labor that they expend. Then, and not until then, can one ask a clinical teacher to give the best part of his work to a medical school.

In a thoroughly well-rounded department of surgery there should be three types of surgeons: (1) The teaching surgeon; (2) the research surgeon, and (3) the practising surgeon. Two of these three types, the teaching and research surgeon, may frequently be combined, but it will be exceptional and extraordinary to find the three combined. The practising surgeon will, as a rule, teach in clinics, and will be of inestimable value to the student in presenting the problems of everyday practice. The teaching surgeon and the research surgeon should be paid a living salary by the school. The practising surgeon should be paid a minimum amount, and will

receive the principal part of his remuneration from his work as a consulting surgeon.

18. *The Association and Co-operation of Departments.* The director of a surgical department should be conversant with and have a competent knowledge of the instruction in all of the contemporary departments in the school. In fact, every department should know what is taught in all the other departments.

A syllabus of the course of instruction in each and all of the departments should be established and interchanged between the various departments in order that time may not be consumed in reiterating previous instruction.

After all, we, as teachers of medicine, are desirous of making well-rounded, well-grounded surgical and medical practitioners, and the main thing to accomplish is to see that the student has a well-rounded and well-grounded instruction. Every surgeon must first have a competent knowledge of medicine. The division between the two subjects is purely arbitrary, and has been made as knowledge has increased. The future means a far more competent knowledge of medicine by surgeons than heretofore.

All of these various methods of teaching surgery are of value. Their success depends largely upon the individual instructor. Some instructors will find that they are fitted only for sectional teaching. Others will find that they are best fitted for clinical demonstrations.

Students vary in their mental capacity and their method of work. Some men can only acquire by hearing; others only acquire by seeing and feeling. Some men never accept any statement unless it is proved —they are a very small minority. Other men accept practically everything that is told them, and are not critical.

Some students acquire knowledge best from systematic lectures; other students will find that they best acquire knowledge by working in an out-patient department or the wards of a hospital. To state that there is a universally applicable best method of surgical instruction is doubtful. One student finds that he can best acquire knowledge from an individual instructor; other men find that they do not acquire knowledge from this instructor, but from another. For this reason it is of great importance that there should be in all schools extramural teaching. The instructors should not be held to a method, but they should be held to results. The methods which I use as an individual instructor may seem superficial to other instructors, or they may consider that my method of instruction is clumsy and that their method is inspiring. The results of an individual instructor alone should determine what is the best method of instruction.

It is obvious to all of us that a new order of things in the teaching of surgery is imminent in this country. If we wisely foster our laboratory and clinical resources and devote our attention to the teaching of surgery, and not simply to the practice of surgery, a new era is before us.

American surgery stands to-day sorely in need of men who are equipped and fitted by scientific methods to advance surgery. Students should be taught along scientific lines by instructors who are competently equipped. When this defect in the lack of scientific training is remedied, then American surgery can challenge the world, for to-day its care of the individual, its asepsis and operative technique, are not excelled.

THE TEACHING OF SURGERY, WITH SPECIAL REFERENCE TO THE DIDACTIC METHOD.

By JOSEPH D. BRYANT, M.D.,
NEW YORK CITY.

As it appears to me, one cannot rationally consider the comparative values of definite integral parts of any plan of complete teaching of a special topic, or of doing anything else, without first comprehending a general system of action for the purpose with which the specially designated parts may logically and effectively blend. The fact that a chain can be no stronger than its weakest link is not lessened in force by the idea that an isolated link may be strengthened without materially adding to the reliable vigor of the chain itself. Whether or not it is possible to so construct a metaphorical chain of surgical teaching that its various links will bear, without parting, the tug of practical experience, is of course a matter of opinion, a matter of proper tempering, if you please, the same as in the instance of a chain of base material. Everything in this life has a language peculiar unto itself, a manner of expression and a feature significant of its individuality. In the common method of expression the word language relates to human articulate speech, a form of speech acquired either as the result of imitation fostered by the urgent needs of intimate contact of the knowing with the ignorant, or is wholly or in part the outcome of didactic method gained through the means of competent agents selected for the purpose.

All animate beings have ways of expression, by the means of which they hold communion with each other, and by means of which they are severally recognized from each other. Metaphorically considered, language may embrace every manner of

communication by the means of which facts relating to things are expressed.

Therefore disease has a language, commonly known as the signs and symptoms of disease; also, health has a language, and health and disease are distinguished from each other by the well-established comparative differences in their respective manners of utterance. Each disease and each surgical condition has its distinctive speech of signs and symptoms by means of which one is known from another. It is hoped that every hearer will now note that medicine and surgery are here linked together at the outset with the idea of emphasizing the fact that their respective languages are not illogically dissimilar, and that to wisely employ surgical methods of cure the surgeon should be as well a good medical interpreter as an expert technician, I know of nothing extant more subversive of the professional dignity and self-respect of a conscientious surgeon than to heed unquestioned a request to operate on a patient for the relief of a surgical condition of which he himself has not mastered the history. But enough of this.

As already observed, human beings, and also their physical inflictions, medical and surgical alike, have each a distinctive language. That of the human race is instilled both by the subjective and objective methods of teaching, the subjective—the didactic—method being employed for the purpose of laying a broad, systematized foundation of enduring intelligence to which the objective—the pseudoclinical—method promptly adds fitness for use. It seems to us that those engaged in "the teaching of surgery" as exemplified by the scientific language of that calling can do no better in achieving their purposes than by first laying for it the same broad and comprehensive foundation along parallel lines of action as is practised by competent lay teachers in the exercise of a comparatively similar feature of general instruction; finally, the wise completion of this structure by means of practical educational methods that establish its fitness for the just demands of life's activities.

In our opinion the practical values of the utterances of surgical speech can be best estimated in all of their features by a stu-

dious inquiry based on the following brief syllabus of a surgical case of whatever nature.

I think it proper to say at this time that the succeeding synopsis has been used by me in systematic surgical instruction for many years with but slight deviations; also, that the members of the class are required to copy and apply it to their text-book studies in surgery, grouping the facts as they read, and writing them promptly under the relative headings of the classification. At once please understand that much of the following phraseology is of the kind employed in impressing upon the students the rationale and importance of this plan of instruction, and therefore need not be regarded as addressed directly to those of adult growth; also, please understand that, from lack of time no attempt will be made to indicate the particular time during the term of study and the special manner of procedure regarded as fitting for the inculcation of the various integral parts of a surgical education.

This synopsis is made up of eleven component parts, so arranged numerically as to be in a logical succession of interdependence. They are arranged in the following order:

1. The Definition.
2. The Anatomy. { Embryological, Histological, General, Regional, Surgical.
3. The Pathology. { Gross, Microscopical.
4. The Classification.
5. The Causation.
6. The Symptoms.
7. The Diagnosis.
8. The Complications.
9. The Treatment.
10. The Prognosis.
11. The Sequels.

The expression "definition" is obviously placed at the head

of the list that the student may prepare himself to know whereof he speaks. With this object in view each student is required to present a comprehensive definition of the topic under consideration, which definition, preferably, should be the product of his own conception rather than one gleaned from text-book lore. In the construction of a definition by the former means, intelligent thought is required, while in expressing by the latter a retentive memory alone may suffice. Let any who may regard this requirement as a too primary matter rapidly write their respective ideas of the definition of some well-recognized surgical topic, and I will risk the prediction that not all of the forms of expression will bear intelligent relationship to each other, and that many of them will be sadly awry and contrary to the diction of Dunglison.

The Anatomy. The anatomy in all the term implies in this connection is placed second in the list, because one ought to know the normal arrangements of the disordered or impaired tissues, so that he may properly locally estimate the nature, degree, extent, and the prospective outcome of a surgical infliction, and also the importance of the proper estimate of congenital features. As the experienced hunter estimates the chief peculiarities of the game he seeks by the distinguishing features of the imprints of its footfalls, so ought the educated surgeon likewise estimate the chief peculiarities of a surgical condition by its imprints on the affected parts.

The Pathology. The pathological effects of disease and injury on human tissues constitute an important part of their history and exercise great influence on the question of the life of the patient and the integrity of the part. It seems to us as fitting that the pathological aspect of a case should go hand-in-hand with the normal, so that a keener appreciation of the value of each can be readily noted by comparison.

The Classification. The classification is next in order, and is so placed because it is regarded to be very important that one shall know the different varieties of the subject under examination, whether it be of an acute, subacute, or chronic form of action, and of local or general significance.

That the individual phenomena of the various forms of a definite surgical infliction often exercise a decisive influence on determining the cause, the importance of the symptoms and signs, the present and prospective complications, the manner of treatment, and the final prognosis, to say nothing of the sequela that may follow, cannot be gainsaid.

The Causation. The causation falls next in order, since the policy of intelligent action requires that the removal of a cause should always, when feasible, constitute the first measure of treatment. The ascertaining of the cause of and the naming of a special condition comprehend the taking of a complete history of a case, without a suitable knowledge of which neither can a proper diagnosis be made nor a rational plan of treatment determined. The expression, the predisposing causes, the exciting causes, and the general and local causes are sources of abundant instruction to the inquiring man when thoroughly interrogated. Then he can, if he wishes, judiciously enlighten the solicitous friends regarding the prognosis and sequels of the event.

The Symptoms and Signs. The symptoms and signs fall naturally into place here, since they as logically precede diagnosis, complications, treatment, and prognosis as do they follow the classification and causation of things. As has already been expressed, symptoms and signs are the language of disease and of surgical conditions; also that each surgical plight has its distinctive form of expression, by means of which it may be known from another kind of a surgical plight; and it is only by careful and learned methods of comparison of the trifling differences in the manner of expression of the various surgical states, in many instances, that one is able to distinguish each by name, or, in other words, make a diagnosis. By a studious analysis of the differences in the language of infirmities one may become wholly as able by this means alone to recognize the name of an indefinite infirmity quite as promptly as one might in a similar manner determine the name of a friend in concealment. By extended comparison of the signs and symptoms of each, one recognizes not only different surgical conditions, but also differ-

ent phases of each condition, thus developing the power of diagnosis and of prognosis as well. Symptoms are easily and understandingly classed into the local and general symptoms, thus aptly fitting the phases of local and general causes, and founding the wisdom of the local and general plans of treatment already mentioned.

The Diagnosis. The diagnosis naturally follows close upon the heels of the evidence bearing on the identity of the affliction. Therefore by diagnosis one may recognize the disease and properly treat it. Diagnosis may be made either by directly considering the symptoms as applied to a definite surgical state, or by a process of exclusion—that is, deciding what it may be by determining what it is not. If the language of a surgical case be not correctly interpreted, the resulting errors in diagnosis and treatment may lessen alike the reputation of the surgeon and the longevity of the patient.

The Complications. The consideration of the complications ought to precede the treatment, because complications modify disease, and therefore their influences should be considered in formulating the treatment of such cases. In fact, the complications may be of such a nature as to become the major element of the trouble and exercise the dominating influence in estimating the prognosis. One hears so often made the statement "if such a complication had not been present the patient would have recovered." In fact, the too-often-heard lay satirical expression, "the operation was successful, but the patient succumbed," is frequently prompted, and, in fact, kept alive, by such occurrences. No case should be subjected to operative interference without a clear conception on the part of the surgeon, and perhaps the patient and friends, of the contributive lethal importance of both present and prospective complications.

The Treatment. The treatment is properly placed on the one hand between the series of truths upon which it depends—*i. e.*, the causation, the symptoms, the complications, etc.; on the other, the prognosis and sequels, the nature of the former of which may largely modify the treatment, while the signifi-

cance of the latter may be dependent upon it. In the absence of a proper knowledge of the important bearings in a case of the aforesaid constituent parts of its investigation, the treatment is misfitting, often void, and perhaps even dangerous, especially in distinctively surgical therapeutics. Since it is undeniable that the results of the treatment of surgical conditions appeal strongly to the lay mind and to the conscience of the surgeon, both wise policy and honorable principles demand sturdy investigation of all matters relating to a case that can in any way influence recovery.

The Prognosis. Since prognosis is based upon the combined influence of each of the preceding subdivisions of a topic, therefore the wisdom of placing prognosis so that a seeming prophesy may, after all, be only the embodiment of a limited number of rational conclusions, appears to be both logically and practically correct. The friends especially appreciate the importance of prognosis, and emphasize their personal interests therein by frequent requests to know "will he get well?" "can the limb be saved?" etc. Wise indeed is he who can so combine his knowledge, discretion, and sympathy as to satisfactorily answer such questions without subsequent loss of personal station and professional reputation.

The Sequels. The sequels, as the word indicates, is the last of the series, and is placed here for obvious reasons. The ability at the outset of a case to estimate the prospective occurrence and the importance of sequels is present in direct proportion to the understanding possessed by the attendant of the importance of effects of disease and injury, of their causation, and the ability to administer proper treatment. It is the sequels of surgical cases that quite too often humiliate the medical profession and enrich the legal.

It is thus that we begin and may continue the direct instructions in surgery. Already, of course, the students have qualified themselves in the various primary branches for the proper utilization of this plan of advanced training. To every individual topic considered in lessons, recitations, and conference, given along didactic text-book lines of action, the use of this synopsis

is more or less closely required, thus causing the student to lay for himself an intelligent, orderly, and logical foundation, which promptly fits him to tell connectedly, without hesitation, what he may know of any surgical subject thus studied. The special advantages of this line of treatment in competitive examinations, or in discussions where one is expected, if not required, to state his entire knowledge of a topic, cannot be gainsaid. As it appears to me, from this standpoint the didactic foundation plan of instruction is now substantially laid. In fact, under this system one, by force of a retentive memory alone, might quite readlly gain a degree, provided practical demonstrations of things were omitted in the final examinations.

Now, permit me briefly to call attention to the next step employed to fit, as we think, the pupil for the professional activities of life. In this instance he is treated the same as he hopes later to be, by the exigencies of his professional environment—that is, given an opportunity practically to determine the cause and prescribe for the relief of human suffering in the presence of the patient.

In this method of instruction the patient and the student are brought face to face, the former as the embodiment of a professional problem for the solution of which the student is caused to apply the principles of action already taught him for the purpose. The student is required, under personal observation or in writing, to ascertain along established lines of investigation a complete history of the case, thereby determining the presence and establishing the significance of the various elements of causation. This investigation discloses the symptoms and signs of the case—its language—enabling the investigator to diagnose it—that is, to call it by name, classify it, determine the presence of complications, estimate the importance of the present and prospective anatomical and pathological changes, and finally logically lead to adopting the best of local and general treatments, thus deciding in a substantial manner the prognosis of a case, also the outlook for sequels and their significance. This the finishing, fitting course in the plan of surgical teaching is clinical in all essential respects, and, as may be noted, sym-

metrically fits the foundation structure already laid by didactic effort.

I have simply framed and welded the two together without entering much into detail, for the reason already expressed Whether recitations or lectures shall be chiefly employed in imparting the basic attainments depends in my judgment more upon the capacity of the respective participants—the teacher and the student—than upon exercising a hard-and-fast rule referable to either plan of teaching. In estimating the comparative worth of these plans of instruction it should be remembered that not all who lecture impart information, nor do all who listen acquire knowledge. The lecturer ought to fertilize the student mind with important facts, lessening his labors and increasing his interest by judicious assorting of the relevant from the irrelevant facts, and emphasizing their respective importance to the educational structure by apt illustrations. The medical tutor may achieve the same aim, provided he have an equal experience and the knowledge befitting the labor. In the latter instance, however, the student, without previous explanation of his task, will likely have given undue time and effort to subordinate facts. It therefore follows that neither plan should be employed to the exclusion of the other, and that each should be practised in accordance with the mutual capacities of all concerned.

Finally, permit me to say, in conclusion, that in my judgment (1) a thorough didactic foundation is absolutely necessary for the proper attainment of surgical knowledge; (2) that clinical teaching fits the student for the intelligent use of didactic facts; (3) that didactic teaching with limited clinical opportunity begets ponderous theorizing, with a minimum of fertile practicability; (4) that clinical teaching with limited didactic opportunity begets much of unreasoning imitation, with limited logical deduction.

DISCUSSION.

Dr. Rudolph Matas, of New Orleans, La.:

I feel some hesitation in opening a discussion on the very instructive papers which we have heard because of their great importance and my inability to do them justice with the short time at my disposal for adequate preparation. Nevertheless, as a teacher of surgery I have been compelled to give thought to the subject, and have some experience with the topic allotted to me which I will be pleased to submit, if only in confirmation of some of the views which have been expressed. I have been deeply impressed with the force of Dr. Burrell's introductory remarks, and realize with him that we are on the eve of great changes in our system of teaching. It is also plain, as he has stated, that in spite of the great attention that has been given in recent years to medical pedagogics that we are still far from reaching clear and well-defined conclusions as to the best methods of teaching surgery. While there are underlying principles which govern the teaching of surgery, these have not yet been clearly determined. With the advent of the four years' course now generally adopted by all reputable colleges the opportunity has come to grade and amplify this branch of instruction in a manner that was impossible a few years ago. Methods, Dr. Burrell says, are incidental to the teaching of surgery, and it is desirable that there should be a number of different methods for its study. On this point I would insist on the difference between the *optional* and the *elective* studies, on the one hand, and the *required* teaching on the other. What should be required and given to pupils in surgery are, Dr. Burrell states, first, the minimum required fundamental knowledge; second, the maximum opportunity to acquire knowledge by personal contact with cases; third, atmosphere and enthusiasm, which mean environment and men. The fundamental character of these requirements no one will deny. The first and third requirements are largely dependent upon the individual teacher and his personality; the second is subject to great variations, according to local conditions and the resources of the institution itself. We cannot expect a university situated in a small centre, which is self-supporting and dependent largely upon the patronage of its pupils for existence, to accomplish the results obtained with the powerful machinery, large personal and unlimited resources of an old and richly endowed university. Yet these discrepancies and variations must always exist in a

country with as wide and diversified a territorial area as ours, just as in Europe, where the small provincial universities, with their limited resources and comparatively small clinics, still find a useful and almost indispensable place in the educational system of the country. This only accentuates the fact that a distinction must be made between the *elective* and *optional* studies, which find their most effective development in the greater metropolitan centres, and the *required* or *essential* instruction which every college, whether great or small, is expected to provide for its pupils in order to meet a certain standard of requirements.

Leaving out of consideration the details of the methods, there are two general propositions that confront every teacher and still wait a satisfactory solution: First, What is the minimum knowledge which must be regarded as fundamental and is to constitute the *required* course in surgery in order that the student, after graduation, shall be prepared to meet the requirements of a general surgical practice? in other words, *What* is it that must be taught, and *how* and by whom is this standard to be determined? Secondly, How (by what methods) is this knowledge to be imparted in order that the teaching may be made the most effective?

It is evident that at the present moment, and in the presence of the multitude and complexity of conditions under which surgery is taught, any discussion of these propositions can only be tentative and suggestive, and that no uniform model can be prescribed. Nevertheless, it cannot be doubted that a certain general standard of requirements, as far as fundamental or essential teaching is concerned, is very desirable, and should be agreed upon some day by those most competent to express authoritative opinions. It is only by threshing the facts as they exist, and as thoroughly as Dr. Burrell has done, that we can expect in the near future to arrive at the generalizations which shall serve as a foundation for a uniform standard of requirements in the teaching of surgery.

Now, as to the didactic lecture as a method or means of teaching surgery, I will at once state that I am emphatically in its favor, and believe it to be just as necessary in the curriculum as the clinic, the laboratory, or the recitation, provided, always, it be safeguarded by the conditions and qualifications so properly insisted upon by Dr. Burrell.

A systematic course of didactic lectures bears the same relationship to the teaching of surgery that a well-illustrated course of lectures on

descriptive anatomy, with lantern slides, specimens, and models, bears to the teaching of anatomy. It is a powerful adjuvant to the surgical clinic; it tends to synthetize, correlate, and organize into a harmonious whole the scattered facts obtained by observation at the bedside. The didactic lecture is useful in presenting a panoramic view—schematic, if you will—but still an outline which gives a general idea to the student of the subject taught in its relative proportions and as a whole. Besides helping to extricate the student out of the maze of facts which bewilder him in his texts, by pointing out those which are essential, the didactic lecture is of inestimable value when it is critical and is accentuated by vivid illustrations drawn from a ripe and varied personal experience. The method of systematic didactic instruction just presented by Dr. Bryant is quite sufficient to demonstrate the value of this method of instruction.

In closing these remarks it may not be inappropriate to refer briefly to the general plan of teaching surgery followed in the medical department of Tulane University. In the *first* year we have abandoned all attempts at clinical teaching as premature and superfluous, and in place of the hospital we have created a laboratory of minor surgery, which is utilized as a basis for practical manual training to develop the hand and the eye without requiring anything but the most elementary knowledge of anatomy and surgery. Systematic exercises in the roller and emergency bandages in first-aid dressings, in the handling of plaster and liquid glass, in improvising splints, etc. The students are exercised in the proper handling of the sick and wounded, and in the litter and ambulance drills adapted from the army manual to civil practice. In the *second* year the student is introduced for the first time to the clinic (out-door or dispensary department of the hospital), where the study of cases and a knowledge of bandaging and lesser manipulations acquired in the laboratory the previous year is applied by the individual student to the patient. A special laboratory course is also given this year in advanced minor surgery, in which anæsthesia, antisepsis, hæmostasis, and all those procedures requiring a knowledge of anatomy and physiology are taught by demonstrations in which the lower animals are systematically utilized. The *third* year is devoted to three classes of subjects: 1. Surgical pathology. 2. Clinical surgery, with special reference to diagnosis and therapeutics. 3. Operative surgery taught systematically by individual exercises in the operative manual on the cadaver. The *fourth* year is devoted to regional surgery and the surgical specialties. Regional surgery is taught meth-

odically in the clinics and in a didactic course, which supplements and systematizes the daily instruction given in the clinics. The abundance of clinical and of cadaveric material has especially favored the development of the clinical side of instruction in our school and has facilitated a liberal training in operative surgery.

In conclusion, I again wish to express my regret at my inability to present in a better form the thoughts and reflections suggested by the papers read. I feel personally very grateful to Doctors Bryant and Burrell. Their contributions to this important subject are most opportune and instructive, and I am sure that we will all profit by them.

Dr. E. Eliot, of New York.

Dr. Burrell asked me to discuss the part of the subject which is included under the head of recitations, and the few remarks which I have to make will be limited to this. The entire subject of surgery from the standpoint of instruction may be divided into the practical and the theoretical, the latter including instruction by means of didactic lectures and recitations. So far as the portion included under the head of recitations is concerned, it should be said to embrace, first, that material which has been presented by the professor in his didactic lectures; secondly, that part of the subject in which instruction is given exclusively by recitation. In regard to the subject-matter, presented didactically, there is no doubt, from my own individual experience, that no matter how excellent the professor or how bright the student there are always misunderstandings which can be cleared up only by personal contact with the professor or instructor.

In regard to the value of the recitation system in the study of that part of the subject which is not touched upon by the head of the department, we are first confronted with the question, "Is it a valuable system of imparting instruction?" I think that it is. I have known in the past students who have received their instruction entirely from the head of the department in the shape of didactic lectures, and I have seen more recently students who have received a certain amount of instruction by recitations. No student really acquires an intelligent knowledge of the subject without the opportunity of first formulating and describing in language what he has learned from books and lectures, and such an opportunity can only be supplied by the recitation system.

The actual value of the recitation, however, depends upon the way

in which it is conducted. As an undergraduate in the academic department of an Eastern university, I attended recitations, as did most of my classmates, with the idea of making a little knowledge go as long a way as possible, endeavoring at the same time to conceal our actual ignorance of the subject-matter, certainly reflecting a very poor and unsatisfactory method of instruction. On the contrary, the recitation should be conducted in such a way as to gain the confidence of the student, who should be impressed by the fact that it is not the instructor's wish to unduly criticise or to ridicule him. The recitation should partake of the nature of a conference, with the object of elucidating those parts of the subject which are imperfectly understood. Do not find fault with the student, but complete his knowledge by first correcting his errors and then by calling his attention to those parts of the subject which have escaped his observation. The recitation conducted in this way is certainly a very valuable adjunct in the teaching of surgery, a view not always shared, however, by the student himself. Every student desires to see blood and to make blood at the earliest opportunity, and is apt to consider the recitation part of his instruction a drudgery. That is what we have to contend with and to overcome so far as lies within our power, but I am quite certain that this may be successfully accomplished and that the enthusiasm and the sympathy of the student may be stimulated by the recitation system of instruction.

Dr. M. H. Richardson, of Boston.

In discussing the anatomical questions raised by the valuable papers of Drs. Bryant and Burrell, I feel that I may be a strongly biased disputant, for I have ever been deeply impressed by the great importance of surgical anatomy. Of late years it has seemed to me that too little time is given the teaching of surgical anatomy by those upon whom the importance of the subject has been by long experience impressed—by those, *e. g.*, who are most competent to teach it.

The principles of modern asepsis applied to surgical operations have made the rapid healing of wounds the rule. In the vast majority of cases aseptic wounds heal quite as readily when the dissections have been slow, unanatomical, and clumsy as when they have been rapid and precise. Indeed, I have heard a surgeon of large experience say that a knowledge of anatomy is bad for the abdominal surgeon because it makes him timid. Such knowledge does make the anatomist timid, but it makes him also bold. It makes him timid

when he ought to be timid, careful when he ought to be careful, slow when he ought to be slow. He is bold and rapid when boldness and rapidity are necessary, and, furthermore, he can be bold and rapid, if need be, when the man who despises anatomy could without disaster be neither.

Surgical anatomy should be taught by the surgeon—by the man who has learned not only the importance of anatomy in general, but the importance of regional anatomy in particular.

To-day surgical anatomy embraces every region of the body. The surgeon of to-day must know how to avoid the portal vein in isolating the common duct as well as surgeons of the old days used to know how to avoid the pneumogastric in tying the carotid; he must know how to drain the pericardium without opening the pleura as well as how to cut into the sac of a strangulated hernia without wounding the gut.

The teaching of surgical anatomy cannot be impressed upon the student by him who has not seen its importance in operations upon the living. Important and indispensable as the teaching of descriptive anatomy is—and no one would admit it more quickly than the surgeon—surgical anatomy is to the operator even more important and indispensable. Prolonged dissecting upon the cadaver is the only real preparation for operative surgery. Only by years of faithful dissecting can the surgeon learn to recognize immediately each anatomical structure. By such practice he will become a rapid and sure dissector; he will save valuable time; he will reduce to a minimum surgical shock and the danger of infection; and, finally, he will acquire a facility in the use of instruments which can be got in no other way. The dissecting-room should be the nursery of operating surgeons, for it bears to the art of surgery the same relation that pathology bears to the science of surgery. It has been to me a source of real regret that at Harvard the anatomical department has ceased to bear this important relation to operative surgery. I think I am not going too far in saying that the whole surgical community feels, directly or indirectly, the loss of the great training school of anatomical surgeons so brilliantly exemplified in such masterly operators as Hodges and Cheever.

Dr. Dudley P. Allen, of Cleveland.

Dr. Burrell has asked me to speak upon two subjects in this discussion, viz., surgical physiology and surgical pathology. I hope that

in doing so you will pardon me if I am somewhat personal in what I have to say. In the line of surgical physiology I have done a considerable amount of experimental work. The conclusion to which it has led me is that in order to do this most successfully a man must be thoroughly equipped for it. A vast amount of work has been done along this line, and I am confident that much of it is of little value. There are so few who thoroughly understand physiology that the number of critics of the work is very limited and the work has about it a glamour which is not founded upon the sterling value of the work which has been done. I would say, therefore, that in order to teach surgical pathology to students it is of the utmost importance that it should be done in a thorough manner and by men who are masters of their subject. If it is not done in this way I do not believe that the work which is done is worthy of serious consideration.

As to the teaching of surgical pathology, I believe that there is no subject in surgery which is of greater value. In the years which have gone by, however, it has been extremely difficult to get practical instruction in this line. By practical work I mean the sort of instruction which brings the laboratory work into connection with clinical work. As a student I did my utmost to get instruction of the kind. I worked in the laboratories of Cohnheim, Virchow, and Wedel, and after Koch discovered the bacillus tuberculosis spent a short time working in his laboratory. After beginning practice I organized a laboratory of my own, and conducted the same for several years with one and two assistants. Later I spent three months working in Ziegler's laboratory. With all this labor, however, except in my own personal work, I found it extremely difficult to secure the practical teaching which I desired. One saw surgical material which had been preserved in the laboratory, but did not connect the material with the clinical cases. It is for this reason that I have sought in the medical department of Western Reserve University to organize this teaching upon a practical basis. In addition to the regular work, such as is commonly given in the medical schools in bacteriology, histology, and pathology, there is an additional course given during the third year in clinical laboratory work. In this course the students are taught to carry out as thoroughly as possible laboratory investigation of specific clinical cases. Having acquired this knowledge previous to the fourth year, it is my plan during the fourth year to require of students laboratory investigations of all kinds in connection with clinical cases. They are supposed to make reports upon

cultures made from infections, upon blood, sputum, and urine, upon tumors which are removed at the clinic, and, in fact, upon whatever cases are assigned to them personally for investigation. The reports made will be submitted to my chief of clinic and will be expected to tally with those made by my pathological assistant in the surgical laboratory under my own direction. I believe it of the highest value for students to acquire such laboratory methods as these, and if they acquire them as students and the habit of using the laboratory in connection with specific cases, the probability is much greater that they will continue to use these methods after they enter upon private practice. I think one of the greatest difficulties with teaching in American medical colleges is that we continually teach the student too much and require of him too little individual work. It is of the highest importance that we should teach students both to think and to work for themselves.

Dr. J. Chalmers Da Costa, of Philadelphia.

In discussing the subject of surgical technique my labor is surely a light one, for I shall only echo an affirmation of practically every word that Dr. Burrell has uttered. He tells us of the importance of the application of bandages and the understanding of surgical apparatus, and calls attention to the fact that with the advent of the gauze bandage there has been a decadence in the art of bandaging. It seems to me that the gauze bandage is almost too extensively employed. It is extremely useful in the dressing of wounds and in the application of certain dressings, especially for the retention of splints, but in the application of some of the old set dressings I believe the unbleached muslin is more valuable. Dr. Burrell asks if we should use models. It seems to me an impossibility for anyone to learn how to bandage by models. When you compare the model with the living individual its only relation is in rough outline. It is a projection of the imagination, and a very poor one. It is without movement, without normal tissue resistance, and without real likeness. It bears the same relation to the real subject that the politician does to the statesman. There is no difficulty in obtaining living models. I do not know how other cities may be, but in the city of Philadelphia there accumulate around the medical schools numerous derelicts of the sea of humanity who, as a rule, are more than willing to be used for bandaging purposes. The one difficulty in teaching the application of bandages and dressings is that you must have numerous assistants.

Students should be encouraged to bandage each other. The best practice is, of course, in the surgical dispensary.

In closing this very brief discussion I do so by repeating what Dr. Burrell has said, *i. e.*, that the art of bandaging should be taught, and not lost.

Dr. James E. Moore, of Minneapolis, Minn.

As an humble representative of the young University of Minnesota I am flattered that I should be called upon by Dr. Burrell, who is a representative of the university, that we are pleased to take as our pattern. It seems to me that the very essential point of teaching is the inspiration that the student derives from his teacher. The man who teaches by routine is not popular, and the students do not learn much from him.

The value of a thorough physical examination of every patient cannot be overestimated, and all surgeons should make it. I remember the case of a patient who came to me in the spring, and I told him his diagnosis was easy. I stated that he had a hydrocele. In the fall, when he came back for operation, I found he had a sarcoma of the testicle, which was not discovered until he was on the operating-table. Had I examined him properly when he returned I should have been spared that humiliation.

Speaking of living models, I have always insisted that the students should use each other, but recently I found one of them had taken advantage of my suggestion and had gotten one of the female students as his model, which caused me to change my recommendation. My early experience as an orthopedist taught me a good deal, and when I had been in the profession but a few years I learned that the main point of an examination was to go over the entire body, no matter what part of the patient is supposed to be diseased. In order to do this it is many times necessary to strip the patient entirely nude. We do this systematically in children, and why should we deprive our older patients of the same advantage? Many times we will discover in a minute something that we would not see in any other way. Tell the students that by careful measurement of the extremities one can ascertain whether a patient is right or left-handed, and the same is true of the legs; tell them that there is a normal difference in the length of the extremities in many cases; teach them to go over the abdomen systematically, especially if the patient complains of dyspeptic symptoms, and by doing these things they will never have the experience I had

recently. A patient came to me complaining of dyspeptic symptoms, and when I asked him to lie upon the couch I found a carcinoma of the pylorus. He told me he had had thirteen doctors, and I was the first one who had stripped him. Each student should be taught to always compare the two sides of a patient. One man's arm may differ normally from another man's arm. The affected side should be compared with the well side. Teach him that the seventh vertebra is prominent, and that some of the spinous processes are more prominent than others normally, and tell him that this does not necessarily mean disease; teach him the natural anatomical dimensions, and impress him with their importance from the surgical standpoint; teach him how to recognize crepitus, and tell him it is something which should be felt and not heard; teach him not to put his ear down to detect crepitus.

I would like to say a word about Dr. Bryant's paper, who was my quiz master, and I want to speak of the value of his system of teaching. We sometimes used to have a séance with the doctor for a couple of hours in the evening, and I learned more in those two hours than in all the rest of the day. His systematic method of beginning at the beginning and ending at the ending has helped me ever since.

Dr. George Emerson Brewer, of New York City.

Dr. Burrell has requested me to take up the question of demonstrations of clinical material to large classes, small sections by ward visits, and in operative clinics, but it will be impossible for me in the short time allotted to consider more than one of these divisions. What I have to say will be on the subject of "section teaching," and I will simply review it as it is carried out to-day at the College of Physicians and Surgeons. Our section teaching in surgery is divided into two courses—the major and the minor. The minor is given during the third year, and consists in instruction in bandaging, ordinary surgical dressing, and the technique of minor operations. The major course is divided into two divisions—the first occupying seven weeks at the Roosevelt Hospital, at which a very few cases are shown to the student and each very thoroughly considered—the other taking place at the Bellevue Hospital, where a large number of cases are shown, often in series illustrating differences occurring in the same disease or injury. In the first course the student's work consists largely in lessons in diagnosis, to which are added demonstrations of technique, of X-ray examinations, cystoscopical and proctoscopical examination, etc. We also attempt to demonstrate to each section methods of constructing

improvised splints for the treatment of fractures and dislocations, and also carrying out aseptic technique under adverse conditions, as seen in tenement houses. The lessons in diagnosis are carried out in the tory is taken the other members of the class are invited to criticise it, following manner: A patient is brought before the class and four students are assigned to it. The first one elicits the history, the second student records the history on a history blank. After the his- and add other inquiries, bringing out additional facts. After this the third student makes the physical examination, while the fourth records it on the history blank. The class is then asked to criticise the examination and suggest other methods of examination when necessary, after which the history and result of the examination are read to the class, and a record of the blood examination, urinary analysis, and any other data bearing upon the case is given by the house officer present. The diagnosis is then made by the method of exclusion. Each one of the original four students states his opinion regarding the probable diagnosis of the case, after which the other members of the class are asked to suggest diagnostic possibilities. Each one of these is written down upon a black-board, and an effort is made to include in this list every possible condition which might explain the symptom and examination findings. The students are then asked in order to exclude each one of these possibilities. If good reasons can be given for excluding any of these diseases it is crossed off. If these reasons are not deemed sufficient by the majority of the class, a question mark is placed after the disease. At the end there are often several conditions which cannot be excluded. These are further discussed, and the students are asked to suggest further inquiries or methods of examination which would serve to establish a correct diagnosis, such as an examination under an anæsthetic or an exploratory operation. The students are then asked to give an opinion regarding prognosis and treatment. This method of treatment has certain advantages, in my opinion. These are, first, that it teaches the student a method of careful diagnosis—that by exclusion—and, although it is often necessary to go through this process in practice, it teaches him a method by which he will unconsciously in later life form his surgical opinions; second, it teaches the student the impossibility in many instances of arriving at a correct diagnosis; third, it not only brings to his mind all the knowledge which he possesses in regard to this particular case, but also serves to refresh his memory regarding the various possibilities which have been considered.

Dr. Robert F. Weir, of New York City.

When I knew that this subject was to be introduced I supposed that Drs. Burrell and Bryant would speak of the various methods they have tried and have determined upon as being most useful. We desire to compare their modes of instruction with those other teachers are using, and to apply them if they seem to be better than ours. Sometimes we have something original and at other times we borrow from others. So far as I can see only two points of moment have been presented — one by Dr. Richardson, to the effect that surgical anatomy should be more largely taught and by a surgeon, and the other by Dr. Allen, concerning the teaching of surgical pathology. I hope it would not be considered out of place if I gave you my experience in the College of Physicians and Surgeons in New York. We all feel the need of improving our methods of surgical instruction. Concerning the didactic lecture, we have diminished it rapidly as we increase our clinical instruction. In my own college we have reduced didactic teaching to one lecture per week, but as a consequence we find there is lately a condition of restlessness on the part of the students about the limitation of teaching. The intelligent men of the various classes feel that a little more didactic instruction without diminishing the clinical instruction is desirable. To respond to their repeated requests I think the faculty will probably have two lectures per week next year instead of one. As to the clinical instruction, our recitations in surgery have already been outlined by Dr. Eliot, and they will be further carried out by introducing teaching of this character earlier in the curriculum. Dr. Burrell states that fundamentals are too largely taught. This is true. We feel that a little too much descriptive anatomy, materia medica, and physiology, is taught. We are now giving some of our surgical teaching in the second year. For our elementary surgical instruction we have two dispensaries which bring in about 60,000 patients per year, of which 20,000 are surgical cases. There the students are taught bandaging and minor surgery. They are allowed to help and make their own diagnosis in the third year. In the same year we have two clinics given in the hospital on the ambulant material, and the students are there assigned in classes of four to a patient, coming with the patient into the room. They make their own diagnosis, and are cross-questioned by the professor and the class. One student is assigned a week previously to prepare a little abstract of some subject which has been illustrated by a patient seen by him and which has not been touched upon in the

didactic lectures. The remarks, which occupy only two pages, are discussed by the students or the professor at the next clinic while being defended very strenuously by the author. This method has been very profitable, and is first given to the third and then the fourth-year students. Then he goes on until he gets the instructions referred to by Dr. Brewer. Differential diagnosis is especially taught, and much experience is gotten by our students in this way from the Roosevelt, Bellevue, and St. Mary's Hospital for Children under sundry instructors. So much has been said about the uselessness of the old-time operation clinics at the hospitals that we feel compelled to defend ourselves. In the main these criticisms are just, as the students on the benches cannot always see what is going on. At our institution we have made a change, and the operation is entirely relegated to a minor position. The teaching is upon a number of selected cases of special interest, probably four or six. They are brought into the arena and talks are made to the class concerning them, occupying from five to ten minutes each. This makes an impression on their minds. Another scheme is that three men of each section in turn are told twenty-four hours previously that such and such cases are to be operated upon at the coming hospital clinic, at which they are to tell the reasons for the operation, what operation should be chosen, and why it is resorted to. They are then duly sterilized, allowed to hold retractors, and do minor assistance at the operation. This method has been welcomed by the students, and I believe will be a great help. The professor's teaching has been changed, the operation is secondary, and the demonstration is made the main part. The operation itself should be, if possible, one that he followed, and to help this a specially concentrated electric light is employed. Dr. Brewer, my assistant, operates and I explain what is being done. I find this works very well, as the operator does not have to be the demonstrator. As to the operative surgery classes, this is a weak point with us, and we are not as broad as we should be. We have groups of three men with an assistant assigned to each cadaver, the one operating and the other to assist him. Each one gets a chance to operate and assist until twelve lessons have been given. We find that the anatomy taught to them in the first year has escaped them to a considerable degree, and we are trying to enforce the rule that the teacher of operative surgery should also be the teacher of surgical anatomy, and that it should be taught in connection with his operative surgery course. When a patient comes to the hospital he should

be observed by a greater number of students, and as he is carried along medically or surgically all the scientific examinations that are made should be observed and recorded by them. For this we have now our pathologist living in the hospital, and also our director of clinical analyses at the hospital for the purpose of doing all the necessary blood and urine work, so that up to the time the patient leaves the hospital or is autopsied everything is carried along under the cognizance of class section.

As a result of this method of teaching our graduates have developed clinically to a satisfactory degree. This is well exemplified in the report that out of a graduating class of 141 this year 100 have been able to secure hospital appointments by competitive examination. This is a much better result than we were able to have some years ago.

Dr. James Bell, of Montreal, Can.

I have been requested to take up the question of conferences—a term which is susceptible of various interpretations. The method of subdivision of the work of reporting cases, which has been referred to, corresponds to what we have in McGill University, and which we call "special ward classes." This was very well described by Dr. Brewer, our plan differing only in detail, however, from that described by him.

We take men of the third and fourth years, ten at a time, from one to two hours into the wards at the bedside. One man investigates the case, and they ask questions of each other, after which the examination is criticised by his colleagues, and finally summarized by the instructor.

Among our requirements for graduation is a certificate from each student that he shall have reported at least ten medical and ten surgical cases, and the supervision of this work is placed in the hands of the senior house surgeon on the surgical side, who meets this reporting class twice a week. He stands in the light of a tutor, and if we have a very enthusiastic man who has the capacity of a teacher the plan works well. The drawback is that we do not have the same man every year; but this idea has introduced a very good principle, and I believe the amplification of these methods will be very beneficial. It would be easy to find men to do this work if we could only find the time for the students.

Our reporters are requested to prepare themselves for operation when their cases are brought into the operating-room, just as the sur-

geons and assistants do, wearing a gown, cleansing their hands, etc., which seems to give them an interest in their work besides being an actual training to some extent.

Dr. John C. Munro, of Boston.

It has been of great interest to me to watch the system of case teaching that Dr. Burrell mentions. The history and examination of some actual case is printed, and a copy is given each student to take home and study. He is requested to form his own individual opinion and judgment as to the diagnosis and treatment. The class assembles, and first the diagnosis is threshed out. Each student offers his own suggestions, and these are placed on the black-board, the unlikely ones then being crossed out. In this part of the process the advantage that the instructor has is of great value, knowing the diagnosis and treatment beforehand, so that he can lead the students on or play them off as he pleases. When the diagnoses have been cut down to one or two probabilities the students are asked about the prognosis, and when this has been discussed by the class the question of treatment is gone into. It is important in this system of teaching to take up actual cases, at first simple ones, but not too simple. It is not wise to take up too obscure conditions; nevertheless, the student should be made to realize that anomalies exist in surgery just as they do in anatomy. The reports should be clear and not slipshod or too suggestive. There are certain limitations to this method, and one is that the student does not himself observe the case, the history being taken by some one else, so that there is lacking that very essential part of personal contact with the case. Of course, this method can be used only to supplement other methods of teaching. The personality of the instructor is very important, and he should be a man who can feel the pulse of his class. He should not be sarcastic. This I think is perhaps as important as it is in recitations. One advantage is that the students can argue with each other and with the instructor, always, of course, on the case under discussion. It trains the student for responsibility; if he advances a diagnosis he must defend it, just as he would if he were called to a case in consultation. Another important thing is that the student must be willing to defend his treatment and his diagnosis according to whether the case may be poor or rich. In each class there are always one or two boys whose surgical instinct stands out conspicuously, and it is interesting to watch them unconsciously defend their diagnosis and treatment against the assaults of their classmates.

Dr. C. B. Nancrede, of Ann Arbor, Mich.

I do not know that there is much left to say but that I have been very much impressed with the various methods of teaching employed during the last thirty-three years. I have gone through this mental evolution myself that I have been listening to, and I wish I had time to explain what we do in our little Western school, but I have been assigned a very narrow province to cover. As to operations on the cadaver and upon the living animal, our students are prepared for this work by the ordinary laboratory course, including bacteriology. We do not allow students to choose for themselves. The students come to the professor, and their surgical anatomy is given them by a practical surgeon. They are made to perform various operations on the dead body. It is compulsory for them to learn certain kinds of surgical technique in suturing dead tissue, especially dead intestines. With this they are taught practically the most elaborate surgical technique, such as the preparation of instruments, the use of anæsthetics and drugs, and are compelled to do the operation under the supervision of experienced men. If the patient dies this stands against the student, and a post-mortem is held in the laboratory especially for that purpose. Our new building, which will be completed in the fall, has several rooms devoted entirely to that kind of treatment. I want to express my gratification at finding that we are all doing exactly the same thing at different times under different names and in different proportions according to our possibilities. If this is true surely we are on the right track. I have not heard of anything to-day that I have not been in the habit of doing. It may be in this semester or that year or this school, but it is done, and I do not know of anything that has not been mentioned. I have not heard of anything that has not been practically done in a different school in a different way, and I think all of our schools are doing just about the same thing as far as it is possible to do.

Dr. A. J. Ochsner, of Chicago.

I wish to emphasize everything that Dr. Burrell has said in his paper concerning the control of a hospital. There can be no doubt but that a medical school in order to be able to utilize the material in the hospital must be in control of the hospital, not nominally, but as a matter of fact. Unless this is controlled a system such as Drs. Weir and Finney have described is impossible. Having the institution under our control, the head of

each department should have complete control of his own department. Then the system can develop and branches may be formed, each branch having its particular influence upon its own students. The system of divided services which exists in so many institutions, having no central head of all the departments, cannot develop, because the student's influence should run in one channel, but as it is he gets out of that channel in the next department. This point is of the greatest importance. Of course, primarily the institution must be conducted for the benefit of the patient, which is the first principle in all surgery. In any institution in which this principle is carried out the student who comes in contact with the patient is benefited, and he learns the principle upon which all his work must depend later on. If that one principle is carried out a good teacher must necessarily carry out the other two principles each day. The point which has not been emphasized enough, and which is possibly an omission, is as to the number of students to be brought in contact with the patient. If you bring twenty students into an operating-room and tell them something about the case, that does not make that case a fact so far as the student is concerned; but if you take one of those students and give him this one patient, letting him carry this patient through with other patients, he can learn from this patient an absolute set of clinical facts, while incidentally the other students may learn many things. I believe this is an important method in small wards. It is just as easy to have six wards with four beds as to have one ward with twenty-four beds, and you can place each ward in charge of two students. During this time the student will be in charge of the patient, and he gets experience which he will carry out later on. He is practically the attending physician and surgeon so far as those four beds are concerned.

I. THE ESSENTIALS OF MODERN HOSPITAL CONSTRUCTION.

By ALBERT VANDER VEER, M.D.,
ALBANY.

THE first important point to take into consideration is the necessity that may exist for the construction of a hospital in either village or city. To one who has given considerable thought and study to the construction of hospitals it becomes apparent that more and more is our profession being consulted, and our opinions listened to with greater earnestness, than in the past regarding the location, etc., of hospital buildings. In the matter of raising the necessary funds we are often consulted, and it is not infrequent that the munificent gift that is suddenly presented to the public, in the form of an endowment, or for construction, has emanated from some proposition made by the physician to his patient, who may at that time, or later on, be in a frame of mind to carry out the advice given for so worthy and benevolent an object. Then, again, it cannot be denied that there is a great responsibility resting upon the members of our profession in the advice and guidance of those who are charitably inclined but have not the experience or time to devote to the development and planning of the construction of such a plant. Funds come to us either as a princely gift or are raised by earnest work on the part of those who believe that such an institution is called for, and from one dollar upward their gifts are appreciated. It is more especially essential in these latter cases that the money should be expended with the utmost care. Great wisdom should also be exercised, even though the sum has come from an individual or individuals known to be very wealthy. No matter how great or small the contribution, each dollar should be used with

caution; therefore, there devolves upon us a responsibility that we ought not to shirk, but should be prepared to meet and be ever ready to draw from our past experiences the lessons that will help us in the best expenditure of these funds.

Proper location of the building should always be very carefully considered. Freedom from dirt, noise, smoke, and odors are the essential points, but this cannot always be secured in crowded cities. Pure air is another consideration that should always be aimed at and reached, if possible, as well as good drainage, etc.

It is always desirable to secure plenty of ground. It may not seem necessary in the beginning, but a hospital successfully managed, and one that does creditable work, is sure to grow, and when space will admit the style of building should be taken into consideration. While, possibly, a two-story pavilion building may cost a little more in its administration as compared with a four, five, or six-story structure, yet the preference is largely in favor of the pavilion, and not too many stories, although there are a number of well-regulated hospitals which are doing excellent work, which, from necessity, in crowded portions of cities, must build up in the air. It cannot be avoided.

The style of building and material used should always be very carefully studied. Even though money may be abundant, it is not always desirable to build of expensive material. The external appearance of the plant need not necessarily be such as to incur undue waste of money, and yet the material at the present time should be carefully considered as to the finish of the interior. We have not yet reached perfection in reference to the amount of wood to be used within the building, nor to the construction of such portions where this material must be utilized. Whatever the building material that is decided upon, it should be of such a quality as will exclude noise, odors, and not encourage the introduction of vermin, rats, mice, insects, or bugs of any kind, a subject that requires very extended consideration.

Then, again, there are many essentials that pertain to the building, such as the separation of the wards, so that the work may be carried on without too great familiarity between the inmates

of the adjoining wards or pavilions and of the employés. Great care should be exercised as to the relation of the wards with the serving-rooms for the distributing of food, that there may be as little noise as possible, and yet be convenient to duty-rooms for nurses and for all work that must, necessarily, cause a certain amount of reverberation. Such sounds should be looked after and segregated as much as possible.

The location of the children's ward should be selected with care. It should be at such a point as not to cause disturbance to the other wards from the exuberant noises that will come from the little ones, noises that they themselves do not seem to notice or cause them any discomfort, yet are a very great tax upon those who cannot bear these sounds.

There is no class of buildings that needs such careful attention as regards light and cheerfulness as does that pertaining to a hospital. There should be no dark rooms and no dark corners or places that cannot be readily exposed to the light and inspection.

The arrangement of the autopsy-room, its location, etc., should be thoroughly studied; not placed where it is likely to attract much attention, or where it may possibly do harm in creating a source of septic conditions, but where proper care may be taken of the dead. Proper records should be kept, so that the causes of death may be accurately considered.

In the administration building proper waiting-rooms, rooms for pathological work, etc., should be thought of, for in a plant, of whatever size, it must be remembered that the scientific work is part of the duty that devolves upon a well-regulated hospital.

One of the essentials in the construction of the modern hospital is that of ventilation, not yet well settled; however, certain phases of the problem are being solved, but it still remains a subject requiring the experience of the sanitary expert combined with the good sense of practical men.

The expense and maintenance should always be taken into consideration; the ease with which the executive department may be conducted, so that the superintendent or those in authority may, without any great disturbance, and with the greatest

celerity, be in constant communication with every portion of the building. The arrangement of the administration building should be such that the house staff is within easy reach at any time within the twenty-four hours, so that all official duties can be attended to with the least friction.

The proper heating of the plant should be carefully considered. Separate buildings for the heating, for generating the power that must necessarily be used about a well-regulated plant for running the elevator, for laundry purposes, for power that may be required for ventilation, for ambulance-house, etc.—all of these should be located at such a point that patients will not be disturbed. The place for admission and departure of the ambulance should be so arranged as not to attract the attention of any patient or inmate of the hospital. The boiler-house is a very essential part of the structure, a particularly serious question when the buildings are five or more stories high.

Also the location of the kitchen is a very important consideration. Odors must not be allowed to creep into the wards, and must not reach the patient whose condition is one of anxiety from serious illness or operation.

The manner of serving food must not be overlooked. It is of the greatest importance that satisfaction be rendered to the patient in the preparation of tea, coffee, etc. All of this work should be done in such a manner as to make things as attractive as possible.

As stated, the location of the ambulance should be so arranged that we make use of all the excellent suggestions that save time in harnessing the horses and such appliances as are employed in the fire department houses of to-day. The ambulance-house is often properly used for housing the male help, the second story being particularly available for this purpose.

These, and many other conditions, must claim the careful attention of the building committee, and of this body there must necessarily be a greater or less representation of our profession.

In the construction of the up-to-date hospital the building for the lodging of the nurses should be constructed with great care, so that proper rest, recreation, and comfort are afforded them to

the fullest extent. No plant, of any size, at the present time can prosper unless it has the loyal, earnest, and faithful support of competent nurses. The nurses' home should be constructed so as to afford a proper meeting place for that portion of every well-regulated hospital that is presided over by women. Where those can gather who are in charge of the training-school, such as the patronesses, those who have charge of the ladies' aid society, those who do so much for the gathering and disposal of contributions that can come only through the tact, skill, and good sense of the female portion of the community, and which depends upon them in such a manner as to produce great good in the institution; these and all proper accommodations should be afforded for the encouragement of this work that is of so much assistance to every successful hospital.

This brings out a point of great importance—*i. e.*, in the care of a large plant the male and female employés should be separated by having the buildings at a distance. All help employed about the plant, so far as possible, should be properly housed. This should be taken into consideration in the construction of the plant. Hospitals, in order to be successfully and skilfully run, must have good, prompt service from their employés. Preparations for the day must, of necessity, begin very early; the help should be on hand, and they should be properly cared for. One of our greatest generals has well said that he "cared not where the soldiers were recruited from; they might be men of doubtful character as regards capacity for work, but if the government furnished them plenty of food and paid them regularly and promptly he would see that the work required of them was thoroughly well done." This applies particularly to all that pertains to the construction of hospitals. We should study this fact more carefully in the future than we have in the past. House our help well and they will help us in return.

In the construction of the plant that is to care for 150 or 500 patients we should take into consideration the arrangement of some hall for the proper entertainments that may be given our nurses from time to time; a proper place for the lectures they are to listen to, and for the demonstrations which may be needed

in giving them the instruction to which they are entitled. Careful thought should be given regarding the value to the profession that such a feature of the hospital work is to afford.

Convalescent patients should be thought of regarding some method of amusement for them. In the study of the construction of the administration building a place should be furnished so that records can be kept with great care and accuracy. In the construction of the building, as regards the expense of maintenance, every point should be carefully studied as to the use of elevators, not providing a greater number than is absolutely required. The automatic elevator of to-day is the acme of success, so far as economy goes, and the same may be said as regards safety.

No plant can be considered complete without a building for the careful study of mental and nervous diseases, a building arranged so that if a patient is suffering from a temporary attack it will be recognized, and the stigma of an asylum or hospital for the insane removed from these unfortunate ones, unless it becomes absolutely necessary to send them there. Many cases, after a few days or weeks, return to perfect health if such accommodations can be afforded. Isolation rooms or wards for the care of contagious diseases must be remembered.

In the construction great care must be exercised in the location of the operating-rooms. The day has gone by when one amphitheatre will answer for the work of an ordinary plant. Surgery has multiplied to such an extent that certain kinds of operations must be done in an operating-room arranged for such work. Light here is of the utmost importance.

We must always bear in mind the necessity of a sufficient number of recovery rooms for the care of the patient who is recovering from the administration of an anæsthetic, or who may be partially delirious, or where the conditions are so serious that life or death is in the balance. Such rooms are necessary also for the care of the seriously sick patient who has pneumonia, typhoid fever, or very acute conditions that need careful consideration and proper attention.

A room for the study of the X-ray work is a necessity. This

latter feature of hospital work of to-day is a very important one. This apparatus requires a room properly ventilated, of a certain temperature, and in connection a room fitted for photographic purposes.

This is a part of the duty that devolves upon those who have before them the building of a properly constructed institution. Their plans should be so arranged that certain portions of the building can be used for strictly charity cases.

Then there should be semi-private wards, a limited number of patients in each room, and rooms for the accommodation of what may be called strictly private patients, those who wish to be entirely by themselves and who are able to pay for such accommodations. I believe that every institution should be managed in such a way that each patient who is able to contribute something toward its maintenance should be encouraged to do so, and in doing this it should be made apparent to them that they are to receive something in return.

Again, when taking into consideration the material necessary for such hospital purposes, great care should be exercised in the making of the floors. This is a subject that is yet under consideration. Floors should be fireproof, and yet not to transmit sound.

The telephone system in connection with the plant should be of the best. Much depends upon a prompt message reaching some portion of the hospital at the proper time.

Obstetrical wards should be arranged with absolute freedom from the possibility of contagion or sepsis. More and more mothers are coming to good institutions, leaving hotels and boarding-houses, because of the better accommodations and greater safety that are given to them in a well-regulated hospital. Here also is a necessity for private rooms. This latter feature is of great importance to every modern hospital, and concerns us, particularly, as a profession. Not only in medicine, but in surgery, we can here do our best work. We can take better care of our patients and accomplish more than we can from house-to-house treatment of many cases.

In the construction, maintenance, and administration of a

modern hospital the board of governors or trustees should be composed not only of laymen, but there should be a representation of the medical and surgical staff. This will bring about, in the majority of instances, greater harmony and economy in both lines of duty.

Let me review a little in this subject assigned to me, and in connection with the plant we are now in. What are the good points in this recently constructed plant? We are fortunate here in that the land was furnished by the city. An easement was granted us by the Park Commissioners, so that we have no fear of our ground being encroached upon or other buildings being constructed so as to shut off our light and ventilation. The cost of construction has been based upon an endeavor to secure such a plant as we needed without that deplorable condition of a debt, and this has been nearly accomplished. The maintenance of this hospital illustrates fully the good derived from encouraging patients to pay whenever they can for their attention. Patients who would be expected to pay for their attendance at home, hotel, or boarding-house are also expected to remunerate us for the services rendered here.

From March 1, 1901, to March 1, 1902, there were admitted into this institution 2127 new patients. Of this number 410 were strictly charity cases; 494 paid at the rate of $5 per week; 667 paid from $8 to $10 per week, while there remained of strictly private patients 556 who paid from $15 to $35 per week for their private rooms. This method has aided very decidedly in the maintenance of the plant.

It has cost us the past fiscal year about $80,000 to maintain this plant, and our income is derived as follows: From patients, as above, a small appropriation from the city, income from invested funds, and contributions from citizens, together with special contributions. In this manner have we met our expenses.

This plant has cost about $292,000 for building and furnishing. This amount is exclusive of the land, and does not include the pavilion for the care of cases of mental diseases, which was built by the county of Albany at a cost of about

$20,000. If we were to build at the present time it would cost us in the neighborhood of $80,000 to $100,000 more to duplicate this hospital.

In the preparation of the plans the Board of Governors and staff of the Albany Hospital desire to express their gratitude to the superintendents of St. Luke's, the Presbyterian, and Roosevelt Hospitals of New York, also the Pennsylvania and Philadelphia hospitals; to all our friends in the medical profession who rendered so much aid, and to our architect, Mr. Albert W. Fuller, who was indefatigable in his preparation of plans and ever ready to make such changes as were suggested from time to time.

This plant will accommodate 200, but by a little crowding we can provide for 225 patients.

II. PAVILION F.

By J. M. MOSHER, M.D.,
ALBANY.

The small pavilion for mental and nervous disorders which you have just seen is the only one of its kind in the United States, and shows, we think, a step forward in hospital administration and in the treatment of this class of cases. This work has not been undertaken by the general hospital since the removal in 1841 of the insane patients from the Pennsylvania Hospital to its special separate department for the insane in West Philadelphia. Although the care of the insane in hospitals built for them is in the greatest degree worthy of our profession, there will probably always be disinclination and hesitation on the part of the friends of the insane to seek a commitment which carries with it the stigma of a mind destroyed, and needs legal measures which proclaim the patient an incompetent person. And yet, often enough, the mental disorder is no worse, if rightly treated, than the delirium of acute fever.

The greatest wrongs to persons mentally afflicted arise from the lack of understanding of the illness by the family and the practising physician. Mismanagement and delay in removal from home are the obstacles to recovery which our new pavilion has been built to overcome. We are yet too young in experience to formulate our results or to predict our future. In less than four months there have been forty admissions. There have been several cases of alcoholism whose goal otherwise would have been the police station or the hospital for the insane. There have been two cases of violent delirium, one during lactation, another due to surgical disease of the uterine adnexa. The clinical charts of these two cases show that the return of health was counted by days, and not by weeks or months. There have been several cases of neurasthenia and hysteria, with intermitting delusions, grafted upon special sense disturbance, which are known in the literature as "borderland cases," in the dangerous period in which insanity threatens. In these cases insanity has been averted, and the patients have been directed toward recovery instead of toward a long and critical illness. As a department of the hospital the pavilion has given relief to trying conditions. Patients with transient mental symptoms in the course of medical and surgical diseases, shown by sudden attacks of frenzy and delirium, aggravated by the activities of the general wards, have found peace and comfort. In short, any patient presenting any nervous symptom making him unfit for either his home or the hospital has here found a refuge.

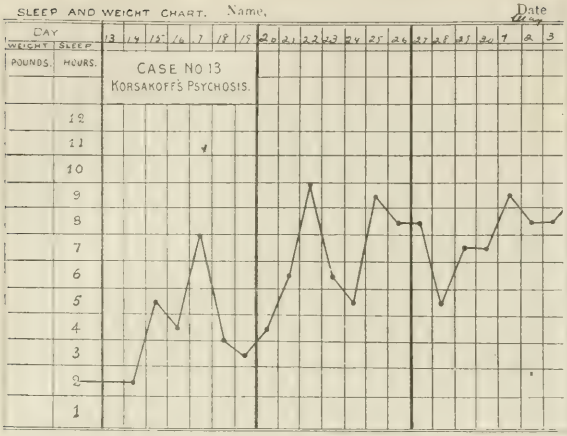
The principle of treatment is expectancy. The plan of the pavilion is such that the uneasiness and noise of mania and delirium give no annoyance to others, and no repressive measures, either mechanical or chemical, have been necessary. The elimination of toxic products and re-establishment of nutrition have led to natural sleep, and, after the first prolonged sleep, the patient causes no further anxiety to the physician.

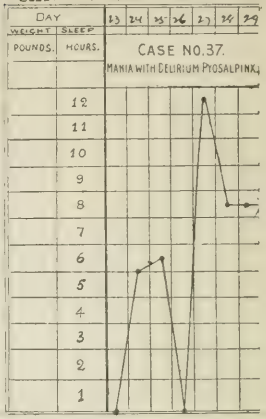
During the next college term the senior students, in sections, will receive bedside clinical instruction in psychiatry, and the didactic lecture will fall to its proper subordinate place.

Thus we have on the east wing and on the west wing of our

ALBANY HOSPITAL—PAVILION F.

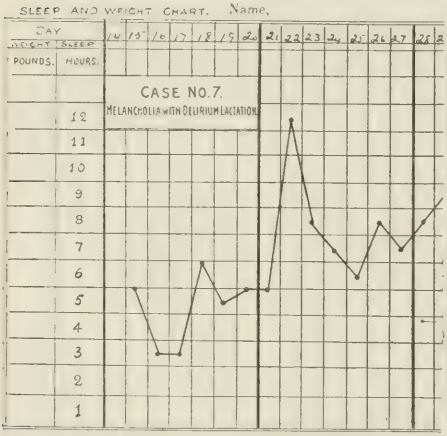
ALBANY H

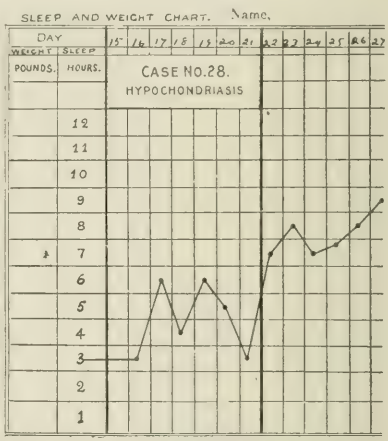




ALBANY HOSPITAL—PAVILI

ALBANY HOSPITAL—P

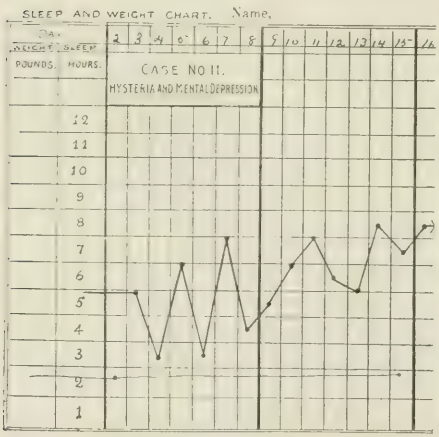


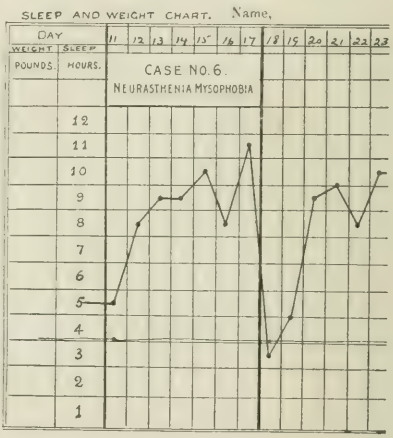


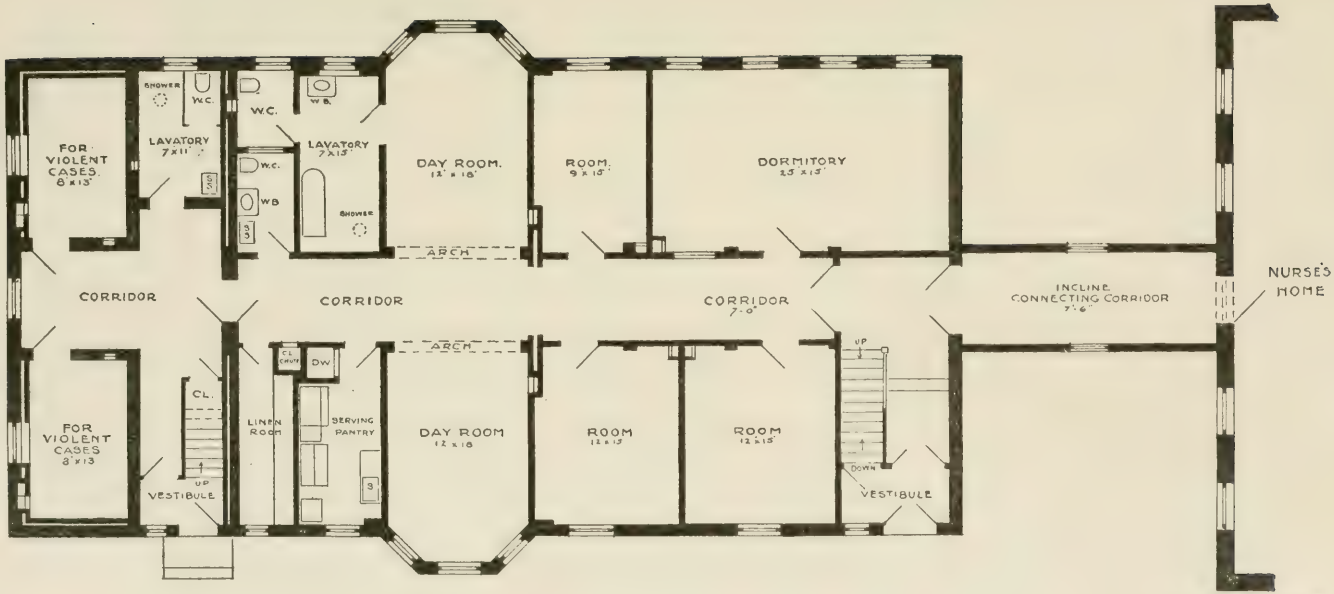
//

ALBANY HOSPITAL—PAVIL

ALBANY HOSPITAL—P







FIRST FLOOR PLAN.

A.W. FULLER, ARCHITECTS.
W.B. PITCHER, ALBANY, N.Y.

hospital two pavilions representing the extremes of practice. In the one are daily enacted the dramatic and heroic scenes of modern surgery, in which time is counted by minutes and seconds. In the other is the medical Fabius, carefully watching each phase, battling not only for life but for the mind, and attaining by tenacity and the courage of delay what his surgical colleague achieves in an instant by a turn of the wrist. Not the least glory of our surgeons has been their loyal co-operation in the promotion of these medical ideas. Soon, by united effort, this splendid hospital system will be completed by a pavilion for contagious diseases. Then it will be possible to bid welcome to every sick person, without regard to condition in life or of disease, and thus to meet in full the obligation imposed by Fabiola, the founder of the first hospital.

III. THE METHOD EMPLOYED IN EXAMINING AND RECORDING PATHOLOGICAL MATERIAL.

By GEORGE BLUMER, M.D.,
ALBANY.

It may be of interest to the members of the Association to know the methods which are now in use for the preservation and examination of pathological material.

The treatment of scrapings and ordinary specimens is different. The scrapings are placed immediately after removal in 95 per cent. alcohol. Ordinary specimens, inasmuch as the laboratory is some little distance from the hospital, are wrapped in moist gauze, then in oiled linen. For ordinary purposes we use as a hardening fluid Orth's fluid, which is 10 per cent. formalin added to Müller's fluid. Embedding is generally done by the celloidin method. For rapid diagnosis we employ the oil of cloves celloidin method. This consists of making up a solution of celloidin which contains about 25 per cent. oil of cloves, the presence of this material causing the celloidin to penetrate very

quickly. We occasionally use also the frozen section method, but in our experience this is at times unreliable, especially in connection with the diagnosis of certain forms of sarcoma and their differentiating from granulation tissue.

The records of cases are kept upon separate sheets, with a cover, and the diagnosis and the patient's name are card indexed. The specimens from different portions of the body are classified according to a decimal system, and each receives two numbers, a classification number and an accession number. Fuller details regarding this method of classification may be found in a paper by the speaker in the *Albany Medical Annals*, November, 1898.

Autopsy records are also kept on separate sheets bound in a cover, and are card indexed both as regards the patient's name and the pathological conditions present.

The results of the pathological examinations are reported to the hospital on special pathological sheets, which are added to the hospital histories.

IV. ASEPTIC TECHNIQUE IN THE ALBANY HOSPITAL.

By C. H. RICHARDSON, M.D.,
ALBANY.

I have been asked to give very briefly an outline of the aseptic surgical technique employed in this hospital.

Of course, you all readily appreciate that the few moments allotted to me will not permit of minute detail; yet the underlying vital principle in any perfect surgical technique is one of detail. It is one of aseptic contact rather than surroundings; "breaks in technique" are only avoided by the consistency with which this principle is carried out. Tile work, marble, brass, and plate glass are very desirable and attractive, but not absolutely necessary.

Nearly everything that is employed in and about the operating-room is sterilized by boiling water, or steam when possible;

the only surgical materials used by us not so sterilized are such as will not permit of it, as catgut, iodoform gauze, and soft urethral instruments.

The clothing worn by the surgeons, assistants, and nurses is of white duck; the coats button tightly about the neck and the sleeves are cut off above the elbow. The suits for each person are folded in separate packages, with a cap which fits snugly over the ears, completely covering the hair, and are sterilized in the regular Kny-Scheerer steam pressure sterilizer. Street clothes are never worn in the operating-room by anyone having any connection whatsoever with the operation. Visitors are required to wear long white linen gowns which cover their clothing more or less completely.

After the suits are put on and the hands are surgically cleansed, a sterilized linen apron is used to cover the whole front of the suit—the suit having been more or less contaminated during the act of changing the clothing. The aprons are not used until the operation is about to begin.

For cleansing the hands we use the modified Fübringer method: first, five minutes, vigorous scrubbing of the hands, forearms, and arms with brush and green soap incorporated with marble dust, paying special attention to cleansing about the nails and webs of the fingers; pointed orange-wood sticks are used in preference to metallic nail cleaners, thereby avoiding scratching the nails, which renders them more difficult of cleansing. A liberal dash of turpentine is now rubbed in until a creamy emulsion is formed, which acts as an antiseptic, but is used principally to emulsify the sebaceous fatty material of the skin. The hands are then thoroughly rinsed in two or three basins of sterile water until all odor of turpentine disappears. They are then immersed and thoroughly rinsed in a 95 per cent. alcohol, which further frees the hands from any greasy material that may remain. The hands and arms, to a point well above the elbows, are now submerged in a 1:1000 bichloride of mercury solution for two minutes; the rubber gloves are then drawn on under the bichloride solution.

It has been our practice for the past two or three years to wear

rubber gloves for practically every operation that is done, and by so doing have accustomed ourselves to their use. As the tactile sense is educated to their use, we find no difficulty in doing the most delicate operation with gloves. We wear rubber gloves in aseptic cases to protect the patient from us; we wear them in septic cases to protect us from the patient. We wear them in all cases to protect the succeeding patient, whom we do not know, against his predecessor.

The gloves worn by the surgeon and first assistant are the Hodgman vulcanized thin gum seamed gloves; the heavy and less expensive seamless gloves are worn by all the assistants and nurses; they are sterilized by washing in soda solution to remove the blood and fatty material and then boiled for fifteen minutes in water, and are transferred with sterile forceps to a large arm basin of sublimate solution, in which they are kept until used; the gloved hand is washed in sterile normal salt solution immediately before the incision is made.

The instrument stands, etc., are covered with sterile towels; instrument trays, sponge basins, salt solution basins, and all enamelled ware used for any purpose about the operation are boiled in a large boiler operated by steam for that purpose. Instruments, etc., are boiled in 1 per cent. soda solution and kept under water in an enamelled instrument tray during the course of the operation. I think this is a decided advantage over laying them on towels and exposing them to contact with the atmosphere.

All the necessary material for each case, such as sheets, pillow-cases, towels, gauze sponges, abdominal sponges, complete dressings, bandages and the like, are packed beforehand in separate packages and sterilized in the steam pressure sterilizer, and are not opened until ready for use. We use the gauze sponges in abdominal work exclusively. They are counted by the operating room nurse when they are put up with the general package, are recounted by the first assistant immediately before the operation, and again by the operating-room nurse after the operation is finished.

Catgut and animal sutures are sterilized by the cumol method.

The cumol sterilizer is an ingenious mechanical apparatus devised by Clarke, of Philadelphia, to carry out the original idea of Kronig. By the use of the instrument this can be done with absolute safety as regards fire.

You are doubtless all familiar with the method; the process, in brief, is: (1) cut the gut into the desired lengths, roll into a figure eight form and tie the isthmus with fine silk; (2) suspend the gut in the wire gauze frame (which fits the interior of the cumol sterilizer), taking care that the gut does not come in contact with the metal at any point; (3) place the wire frame in a dry heat oven, raise the heat to between 60° and 70° C. for first hour; between 70° and 80° C. for second hour, and 80° C. for third hour; this dries the gut thoroughly; (4) transfer the frames from the oven to the cumol in the sterilizer, which should show a temperature of 100° C. at the time; gradually raise this to 150° and hold at that point one hour; (5) take the frames out of the cumol with sterilized forceps, rub them in sterilized towels and replace in dry oven (temperature 100°) for two hours; this evaporates the cumol and dries the gut, and, if the process is properly done, no odor of the cumol can be detected; (6) transfer the sutures with sterile forceps into previously sterilized test-tubes, mark sizes on these and close them with aseptic cotton-wool plugs. By the above process no water comes in contact with the suture material—hence its strength is not impaired. Numerous bacteriological tests have shown it to be absolutely aseptic. However, it is our custom to have each batch tested at the laboratory before it is used.

The silkworm-gut employed in this hospital is prepared by a method which dyes it black; this is a distinct advantage in certain classes of work where the color enables it to be seen and easily removed.

The process (for 400 strands): In an agate-ware basin place a 6 per cent. nitrate of silver solution, in which the gut is deposited when cold; allow it to heat over a slow Bunsen burner until it steams or simmers for twenty minutes, being careful not to let it boil at any time; stir the gut constantly with a glass rod, and turn it frequently. This must be done at night or in a dark

room; a pound of ordinary Rochelle salts is now added as a reducing agent. This acts on the solution by reducing the free metallic silver, which is deposited, but does not act on the silver absorbed by the silkworm-gut. In the morning the strands are washed in sterile water and exposed in a large Petrie dish for an hour to the actinic rays of the sun. It is colored a very dark brown, which afterward turns black and is permanent. It is now polished by means of a cloth or towel, six strands are made into a figure eight bunch, and two of these bunches, enough for one case, are put into a clean test-tube and sealed with cotton-wool. It is now subjected to the steam sterilizer, the same as dressings. We use the best China twist silk that can be obtained, in sizes ranging from No. 00 to No. 4.

The silk is tightly wound from the skein on nickel-plated metal frames two inches wide by six inches long. Usually three skeins of each size are prepared at a time; they are then rubbed in a towel and placed in boiling distilled water for ten minutes, after which they are transferred to the slow dry-heat oven, never raised above body temperature, and allowed to dry for five or six hours. If this is carefully done the silk does not "crumple" or untwist, but presents a smooth sort of translucent, waxy appearance. Twenty feet of each size is wound on separate spools placed in a previously sterilized ignition-tube, which is sealed with loose cotton for a plug, and then the whole tube is subjected to the regular steam-pressure sterilizer. The tube remains sterile until used.

Silver foil is sterilized in plugged test-tubes in the autoclave.

Iodoform gauze is manufactured in the hospital under strict asepsis. The soap-suds, glycerin, 5 per cent. carbolic solution, and gauze are sterilized. The nurse, when making it, wears sterile rubber gloves. The desired lengths are then wound in a loose roll and placed in the large ignition-tube, plugged loosely with cotton-wool, and subjected for twelve hours to formaldehyde gas.

Salt solution is made up in a concentrated form and sterilized in flasks in a steam sterilizer. By adding 125 cubic centimetres to a gallon of distilled boiled water from the apparatus in the

sterilizing room a six-tenths of one per cent., or normal salt solution, is readily obtained for any purpose required, such as infusions or flushing the abdominal cavity.

Urethral instruments are rendered aseptic by washing with soap and water and subjected for twelve hours to the fumes of formaldehyde gas and kept in sealed glass tubes until ready for use.

Trusting that this brief outline will give you some idea of aseptic technique as we interpret it, I beg to thank you very sincerely for your kind attention.

V. REMARKS ON THE METHOD OF KEEPING HISTORIES OF SURGICAL PATIENTS IN THE ALBANY HOSPITAL.

By ARTHUR W. ELTING, M.D.,
ALBANY.

One of the most important functions of every well-conducted hospital is the collection and preservation of accurate and systematic records of the patients who may be treated in the hospital. From a somewhat extended study of the methods employed for the keeping of records in a considerable number of the larger hospitals in the United States, it is very evident that there is no uniformity of opinion as to the best method to be employed. The system in use in this hospital was instituted two years ago, and the practicability of the scheme has been amply proved by the results, sufficient time having elapsed to allow us to discover and remedy any defects that may have presented themselves.

Let us first enumerate the different blanks which are used in keeping a history of a surgical case. The first history-sheet enables one at a glance to determine the more important data regarding the case, and in a conspicuous place contains the name,

diagnosis, and surgical number. The second history-sheet presents the history of the patient, both present and past, as well as the physical examination. The third sheet contains a description of the operation, if one was performed, and it is the rule of the institution that the first assistant at every operation shall be held responsible for a description of the same. The fourth sheet is specially ruled and contains the surgeon's orders. The fifth sheet, also specially ruled, is devoted to the bedside notes, and is kept by the nurse in charge. The sixth sheet comprises the temperature chart, while the seventh sheet presents the urine analysis, the blood and sputum examination, etc.; and lastly is the pathological sheet, which states briefly the macroscopical as well as the microscopical diagnosis of any tissues removed at the time of the operation, as well as the result of any bacteriological examination that may have been made.

A separate book is kept in which the name of every surgical patient is entered, as well as the date of admission, and in which each surgical patient is given a surgical number at the time of admission. Opposite the name the diagnosis is also written in this book at the time of discharge from the hospital. The surgical numbers begin at one and will continue indefinitely, so that there will never be any danger of two patients receiving the same number.

A card catalogue of all surgical patients is kept, and is arranged alphabetically, according to the name of the patients. This card is specially ruled, and upon it appears the name of the patient, the date of admission, the diagnosis, and the name of the attending surgeon.

The histories are kept in boxes, and the method of classification is an arbitrary one according to disease. The histories are so arranged in these boxes that the latest case of any particular disease is upon the top, and the next latest history is just beneath. It is thus comparatively easy to find the history of any patient, provided we are given the name, for the card index gives us the diagnosis and the surgical number. The diagnosis indicates in what box the history will be found, and the surgical number indicates about where in the box to look for the history.

As the boxes become filled the histories are removed and done up in bundles of fifty each, and on the outside of each bundle is a slip of paper containing the name, surgical number, and the attending surgeon of each of the histories contained in the package. Thus easy access can be had to histories, no matter how long ago they may have been filed away.

COMPLICATIONS FOLLOWING GASTRO-ENTEROSTOMY.

By WILLIAM J. MAYO, A.M., M.D.,
ROCHESTER.

In St. Mary's Hospital, of Rochester, Minn., during the past ten years, 98 gastro-enterostomies have been performed by my brother, Dr. Charles H. Mayo, or myself, with 9 deaths, the mortality in the malignant cases being 20 per cent., and in the benign series 6 per cent. During this time 14 pylorectomies and partial gastrectomies have been made, with 2 deaths, 14 per cent. Of these 9 were excisions, with complete closure of both the stomach and duodenal ends, communication being established by means of an independent gastro-jejunostomy of the usual type. Of these 1 died.

For the purpose of this study these 9 cases are added to the 98 cases above mentioned, giving 107 gastro-enterostomies, with 10 deaths, an average mortality of 9 per cent. The cause of death was as follows: exhaustion, 3 cases; an exhaustion in which pernicious vomiting was a prominent feature, 2 cases; progressive pneumonia, 3 cases; detachment of the anastomosed intestine from the stomach wall, 2 cases. The deaths from exhaustion were due to the extreme starvation which existed at the time of the operation. The patients would appear fairly well until the fourth to seventh day, when a gradual failure of the vital forces would appear and death ensue in the course of from twelve to twenty-four hours, the post-mortem showing the abdominal condition to be good. Cachectic subjects bear rectal feeding badly, and early giving of nourishment by the stomach should be practised when possible.

The two cases in which regurgitant vomiting hastened the fatal ending were among the early operations, in which the intestine was joined to the anterior wall of the stomach, half-way between the greater and lesser curvatures, causing an intragastric pouch to form, which contributed to the unfortunate complication. In neither one could it be said that the vomiting itself caused death, but in the feeble condition of the patients it certainly was a factor. It will be noted that nearly one-third of the total death-rate was due to bronchopneumonia.

There have been many explanations as to the frequency of lung complications following operations upon the stomach. It was thought to occur as a result of general anæsthesia, but experience has shown that it is relatively as frequent after the use of a local anæsthetic. The situation of the incision in the epigastrium, preventing coughing and expectoration, is thought to be an element in causation, yet similar incisions in the gall-bladder region have no such effect. The latest theory is that some of the venous blood returning from the stomach does not pass through the portal vein, and in this way infected emboli are carried directly into the circulation and pass at once to the lungs. In two of the three cases a chronic bronchial cough was present at the time of operation, and the patients were in bad general condition. In one case material was aspirated through the trachea from the œsophagus, causing an aspiration pneumonia. It is difficult by means of the stomach-tube to thoroughly cleanse and empty the greatly dilated stomach in debilitated subjects. In this case, on elevating the stomach out of the abdominal incision, some of the fluid contents gravitated into the œsophagus. This should be avoided in these cases by elevation of the head and thorax at this time. The recumbent posture has also an evil influence on some cases, and we now encourage the old and feeble to sit up early.

It is evident that there is as yet no entirely adequate explanation for the production of the pulmonary complication. There are probably several contributing causes in most cases.

In the two cases in which the anastomosed intestine detached, causing death from leakage, one took place on the seventh day

after gastro-enterostomy for malignant pyloric obstruction. There was a small amount of free fluid present in the abdomen at the time of operation, which would usually contraindicate a plastic procedure such as gastro-enterostomy. In the second case detachment on the ninth day followed an epileptic seizure. This was in a patient with benign obstruction, who had up to that time done unusually well. He had suffered from epilepsy for years, and the aura began in the epigastric region. In a violent contraction of the stomach such a detachment might easily take place. Chlumsky's experiments on presumably healthy animals went to show that after five days the union was perfect. That this is not true as to diseased states in the human subject is shown by these two cases.

Of the 97 cases which recovered from the operation 5 benign cases came to secondary operation on account of changes at the anastomotic orifice (5 per cent.).

The most important feature in the mechanics of the anastomosis is that the union shall be at the inferior border of the stomach, close to the greater curvature and at the bottom of the stomach pouch, giving a funnel shape. Properly placed the anastomotic opening should have its inferior border at the bottom of the stomach, and as to whether the opening shall extend from this point upward anteriorly or posteriorly is really of little moment (see Plate). The anterior operation has usually been placed relatively higher than the posterior, to avoid the bloodvessels, causing an intragastric pouch to form, which has been one source of pernicious vomiting. The posterior operation for technical reasons (easier exposure) is usually placed nearer the greater curvature. The union in the 107 cases under discussion was made to the anterior wall of the stomach 83 times, and 24 times to the posterior wall, with equally good results, so that location of the opening on the anterior or posterior wall cannot of itself be essential.

In the experience of the writer the one operation is as easy as the other. For thin subjects with a long mesocolon we prefer the posterior method. If the mesentery is short or contains much fat, or if the vascular loop from the superior mesenteric

artery, which supplies the transverse colon, is small, bringing the opening in the posterior layer of the gastrocolic omentum in close proximity to it, the anterior operation is preferred. After posterior gastro-enterostomy the torn edges of the mesentery are sutured to the posterior wall of the stomach, as advised by Willy Meyer, to prevent downward displacement and interference with the loop, as happened to Czerny, Korte, and others. The sutures are so introduced as to provide a short flap of the mesenteric margin, which drops over the anastomotic opening, furnishing further protection. After the anterior operation the edges of the omentum are caught each side of the anastomosis and sutured to each other and to the stomach wall one inch above the opening. The edges are united to each other downward for three inches, forming an apron over the anastomosis, yet having no connection with it, and as this is done with a fine catgut suture, the adhesion is not of itself permanent. This makes the omentum available if leakage occurs, and in time the omentum returns to its normal situation, if no accident occurs, as I have had an opportunity to verify later.

This may seem an unnecessary precaution, but when it is considered that 20 per cent. of the deaths were due to separation of the bowel from the stomach at a time (ninth and tenth days) when neither suture nor button would furnish adequate support, it is not unreasonable. Both of the fatal cases were anterior operations, and it was the superior edge of the union which gave way, as shown by post-mortem. The inferior margin, being protected by the origin of the omentum, was exceedingly firm. We have used the Murphy button in all of our cases excepting one, in which the suture and the Robson bone bobbin were employed to meet a special indication.

Case I. *Gastro-enterostomy; reoperation four years later for secondary ulceration; recovery.*—Mrs. H. H. O., aged thirty-eight years, Scandinavian, mother of three children, housewife. Admitted to St. Mary's Hospital, May, 1899, with the following history:

Has had symptoms of ulceration of the stomach for several years;

for the past two years the trouble has been constant. The vomiting, which at first was immediately after taking food, is now delayed a number of hours, and the larger part of the nourishment is eventually rejected. She eats as small an amount as possible, and is confined entirely to liquid food. Has lost thirty-five pounds or more in weight. Personal and family history good.

Physical Examination. Emaciation marked, skin dry, pulse and temperature normal. Upper abdominal region distended. On inspection peristaltic waves can be seen passing from left to right. Splashing phenomenon easily developed. On air distention the greater curvature of the stomach found to lie on a line with the crest of the ilium. Test-meal shows free acids. Diagnosis, benign pyloric obstruction due to the cicatrization of an ulcer.

Operation. Irregular cicatrix involving pylorus three-fourths inch in diameter and one and one-fourth inch in length. Anterior gastro-enterostomy. Recovery uneventful. For three years remained in splendid health, gaining over forty pounds in weight. April, 1902, re-admitted on account of return of previous symptoms of obstruction, which had begun suddenly three months before, and were supposed to be due to an attack of appendicitis. Patient had lost much flesh, and was on a liquid diet. The trouble was evidently due to some interference with the outlet of the stomach.

Operation, April 2, 1902. A mass of adhesions was encountered to the right of the median line, due to an ulcer of the stomach just above the anastomotic orifice, and involving the opening above and upon the right side.

Perforation had occurred, and the adhesion to the abdominal wall had prevented leakage. The transverse colon was closely adherent and much reduced in calibre where it passed under the anastomosis. The entire ulcerated area was excised, leaving a large opening, with only one-fourth of the gastro-intestinal union on the left side intact. This defect was sutured, and the gastro-enterostomy completed by suture over a Robson bone bobbin, the large plastic being protected by the omentum. The button was found in the stomach somewhat corroded, but in fairly workable condition. Pylorus completely obstructed. The stomach was drawn down into a funnel at the site of the anastomosis, and I am under the impression that at the time of the sudden symptoms the button became impacted and caused the ulceration. This is surmise, as it was found in the fundus of the stomach.

Each button should be carefully inspected before it is used. We have found on an average nearly 20 per cent. of buttons of imperfect workmanship and dangerous.

If the stomach wall is thick the muscular and peritoneal coats should be incised before the suture is placed, and the suture should grasp only a small portion of these structures, otherwise the button may be held in position unduly long. In many cases in which the button passes, vomiting with symptoms of obstruction may appear in the second or third week, while it is in transit. Gastric lavage and rectal feeding for a day or two causes these symptoms to subside.

The suture operation for gastro-enterostomy is undoubtedly just as good as the button, and so far as can be judged the results are about the same. Among the men of great experience Kocker uses the suture and the posterior method, Czerny the button and the posterior, Mikulicz prefers the suture in benign cases and the button in malignant cases, and uses the anterior operation altogether. He finds that an entero-anastomosis is necessary in the suture operation, to prevent pernicious vomiting, but does not find it necessary with the button, which tends to prevent angulation while in situ, and this is during the dangerous period. Robson's bone bobbin acts in a similar manner. Kelling found that with the suture a ring of mucous membrane projected into the stomach, diminishing the calibre of the opening. The opening is less perfect with the suture, and entero-anastomosis is more often necessary to prevent pernicious vomiting. These advantages in favor of the button are counterbalanced by its tendency to drop into the stomach and remain there (Case I.). This usually does no harm, and in malignant disease at least does not counterbalance the advantage.

In our earlier experience with gastro-enterostomy the operation was performed entirely for pyloric obstruction, and in but two cases (Cases IV. and V.) did any secondary complication develop with regard to the orifice, excepting its occasional occlusion by an advancing malignant growth. Two cases of malignant obstruction examined post-mortem after the lapse of some months showed no marked contraction of the opening. For

non-malignant pyloric obstruction cases in the best of health all the way from the present time up to eight years after the operation, demonstrate the permanence of the artificial opening. In two benign cases dying of other causes, six months and three years, respectively, after the operation, and representing an anterior and posterior location of opening, there was no contraction. In a case reported by Cordier after six and one-half years, death from other cause allowed of post-mortem, and there was no contraction of the anastomotic opening found. Without going into detail it may be said that if permanent obstruction at the pylorus exists no marked contraction of a properly formed gastro-enterostomy may be feared unless by accident (Cases IV. and V.).

About three years ago gastro-enterosotomy for the relief of ulcer was first performed at St. Mary's Hospital, and since that time, with increasing frequency, about twenty-five cases in all. In a majority of these cases the pylorus was not mechanically obstructed, although the ulcer was usually in the pyloric region, and in some cases ultimate cicatrization might be expected to materially reduce the calibre of the normal opening. In three of these cases angulation and obstruction at the site of the anastomosis occurred at a later date (Cases II., III., and IV.). In these cases secondary exploration revealed a marked contraction of the orifice, reducing its size to that of a lead-pencil or less, although in no case was obliteration complete. There was found an angulation of the jejunum at the attachment, causing a spur, which accounted for the symptoms. The reduction, so far as the stomach was concerned, was of little moment, but a contraction involving one-third of the lumen of the small bowel was serious and caused valve formation.

Case II. *Entero-anastomosis thirteen months after gastro-enterostomy; recovery.*—Miss G. C., aged twenty-one years, American, seamstress. Admitted to St. Mary's Hospital May 9, 1900, with a typical history of ulcer, which had existed for more than a year and defied ordinary methods of treatment. Hæmatemesis had been a prominent feature, and on two occasions so copious as to threaten life. Had lost twenty-

five pounds in weight. Family and personal history otherwise good.

Physical Examination. Marked anæmia from the hemorrhages. Organs other than stomach normal. A painful point the size of a silver dollar in the epigastrium. Stomach contents not examined, it being feared that the necessary manipulation might cause a return of the hemorrhage. May 10th, anterior gastro-jejunostomy, Murphy button. Stomach small, pylorus unobstructed, ulceration on lesser curvature of irregular outline, an inch in diameter, shown by induration and covered by perigastric adhesions. Button passed during third week. Discharged in the fourth week. Rapid gain in weight and complete disappearance of symptoms for four months. Then began to have attacks of burning pain in the stomach. These became more frequent, and occasionally a little bile-stained fluid would be vomited. This was not attended by great loss of weight or strength, but was very annoying.

In June, 1901, exploration revealed the fact that the gastro-intestinal fistula had contracted to the size of a lead-pencil or smaller; this produced a kink of the jejunum at the site of the anastomosis. Entero-anastomosis between the afferent and efferent limbs of the jejunum promptly relieved the symptoms. Patient now in good health.

Case III. *Secondary gastro-enterostomy and entero anastomosis twenty days after primary gastro-enterostomy; recovery.*—P. D., aged thirty years, German, farmer. Admitted to St. Mary's Hospital, March 21, 1901. History of chronic ulcer of the stomach extending over six years, which had obstinately resisted treatment. During most of this time he had been incapacitated for labor. To relieve the pain semistarvation had been practised. Personal and family history immaterial.

Physical Examination. An emaciated man of sallow complexion, dry and leathery skin. Heart, lungs, kidneya, etc., in normal condition. Tenderness just above umbilicus. Stomach moderately dilated, free acid, and some retardation of food. March 22, anterior gastro-jejunostomy, Murphy button. Ulcer on posterior wall and adherent to pancreas. The latter enlarged and thickened, no mechanical obstruction at the pylorus. For two weeks patient did very well, then began to vomit biliary and pancreatic secretions; button passed on sixteenth day. Vomiting at first intermittent, and no food returned unless given during the period of active regurgitation. Twenty

days after the primary operation the abdomen was reopened. The anastomotic opening had contracted to the size of a lead-pencil, and spur formation of the small bowel was marked. As it seemed improbable that the ulcer should have permanently cicatrized in the short space of time, anterior gastro-jejunostomy was again performed with the Murphy button, and an entero-anastomosis short-circuiting the biliary and pancreatic secretions below both openings was made by means of a small button. Discharged in three weeks. Rapid gain in weight and strength. He is now in good health and able to perform manual labor.

Entero-anastomosis promptly relieved the condition in two cases. In the third, for reasons referred to later, death ensued. Contraction of the anastomotic opening is to be expected if the pylorus is unobstructed, but that it does not always produce symptoms was shown in a fourth case in which gastro-enterostomy for an active ulcer had promptly relieved a most serious condition. At a secondary operation for a pelvic tumor, some months later, great contraction of the orifice was found, but without unpleasant symptoms arising therefrom. The writer was under the impression, in Case III., after the first entero-anastomosis failed to relieve, that perhaps the kinking caused the bile to accumulate in the duodenum and that the regurgitation was through the pylorus. For this reason the pylorus was excised, with complete closure of both the duodenum and stomach ends, yet this failed to check the biliary vomiting, showing conclusively that it was the spur at the opening alone which was responsible for the trouble. Von Eiselsberg reports cases in which he has closed the pylorus for the same reason by a circular purse-string suture.

The question of the reduction of the opening taking place in the greatly dilated stomach *pari passu* with the contraction of the stomach itself has been pretty well settled by Robson, Korte, and others. The stagnation is promptly relieved, but the hyperdilated stomach does not contract much, and the lesser degrees of dilatation which regain normal size do not materially affect the anastomotic opening. Carle and Fantino have shown conclusively that small quantities of bile are to be found in the

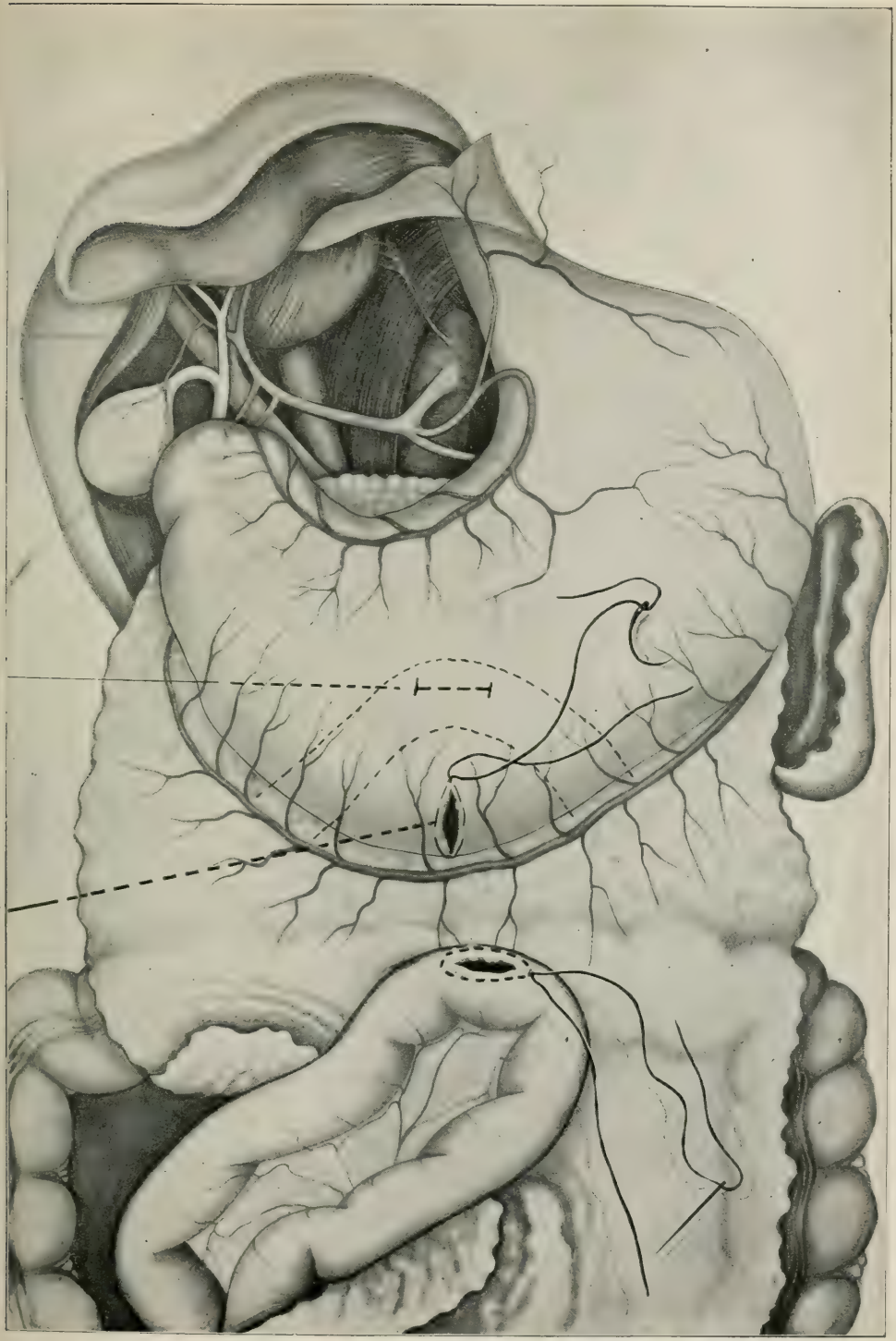
stomach after gastro-enterostomy, and that it does not lead to trouble. Ferrier and others have connected the gall-bladder directly with the stomach without interfering with digestion. The pancreatic juice cannot be the cause, as Stendel has experimentally divided the jejunum, fastening the open end to the stomach and closing the duodenum completely at the severed point, causing all the biliary and pancreatic secretions to pass through the stomach, yet no harm resulted. This was also true in Moynahan's case, in which this procedure was carried out on the human subject. McGraw believes that the views of Kelling are correct, and that it is the distention of the duodenum which is responsible for the evil effects. The fact remains that entero-anastomosis between the proximal and distal loops of the intestine, short-circuiting these secretions, relieves the condition.

The possibility of secondary spur formation following gastro-enterostomy for ulcer, in which the pylorus is open, must be borne in mind, and, if possible, excision of the ulcer is to be preferred. This the writer has been able to do three times for gastric ulcer and once for duodenal. It has been advocated, especially in this country by Robert Weir, to perform an entero-anastomosis in all cases of gastro-enterostomy at the primary operation.

This is certainly logical in the cases under consideration in which the pylorus is open.

We have preferred the simple operation of entero-anastomosis rather than the more elaborate methods of Roux and others, and in only one case—that a posterior operation—has relief failed to follow. This was due to the fact that the jejunum was anastomosed so close to its origin as to prevent proper drainage from the proximal side through the interintestinal fistula.

Case IV. *Gastro-enterostomy, followed by entero-anastomosis; pylorectomy; entero-anastomosis; Roux's operation; death.*—Mrs. J. M., aged forty-two years, one child; Scandinavian, housewife. Admitted to St. Mary's Hospital on June 19, 1901. Typical history of chronic ulcer of the stomach. For three years symptoms were: nearly constant



Showing proper and improper locations of opening. *a*, Proper position, leaving no pouch; *b*, usual position, forming intragastric pouch.

vomiting, pain, loss of weight and strength, confined to bed for several weeks previous to admission to the hospital, and for some months has required opiates more or less constantly. Personal and family history good.

Physical Examination. Emaciation marked. Painful area in epigastrium. Stomach not increased in size. Free acid. June 20th, posterior gastro-jejunostomy. Murphy button attachment to jejunum about six inches from its origin. Stomach not dilated, pylorus open, location of ulcer could not be accurately determined on account of perigastric adhesions. Gall-bladder contained one stone, evidently slumbering, as there were no evidences of disease about this viscus. Stone removed and gall-bladder drained through stab wound on the right side. Patient discharged in good condition on the twentieth day. July 24, 1901, readmitted; one week before had commenced to have attacks of burning pain in the stomach, and since had regurgitated a little bile-stained fluid at frequent intervals. Gastric lavage failed to relieve the symptoms.

June 25th, entero-anastomosis. Operation difficult and unsatisfactory on account of the short length of the afferent intestine, and when completed the interintestinal fistula was on a level with the gastric opening, and only about two inches from it. Gastro-enterostomy moderately contracted and angulation of the attached jejunum.

Condition improved rapidly, and for a time was apparently relieved. October 12th, readmitted with all of the old symptoms in an aggravated form. Under the impression that the biliary and pancreatic secretions entered the stomach through the pylorus, on October 14th pylorectomy was performed, and the duodenum and stomach completely closed by a purse-string suture. No relief. October 18th a second button entero-anastomosis was made. This was a mistake, as between the previous entero-anastomosis and the origin of the jejunum there was less than three inches. Some relief was experienced for a few days. October 30th the previous symptoms had returned with increased severity, and as the patient was becoming exhausted, as a final resort the operation of Roux was performed. The adhesions from the previous operations rendered this extremely difficult. The jejunum was divided as close as possible to the last entero-anastomosis and the distal end turned in by a purse-string suture. Less than an inch of jejunum projected on the proximal side. A Murphy button was inserted, and with some difficulty secured in position. A loop of

bowel sixteen inches below was attached laterally. Patient returned to bed in bad condition, and died thirty-six hours later. A melancholy ending after such courage and endurance.

This at once brings up the question as to how long a loop of jejunum should be made above the point of anastomosis. Robson says that for the anterior method twelve inches is about right, and for the posterior somewhat less. Mikulicz says that 15 c.c. is the necessary amount for the posterior operation, and 50 c.c. for the anterior operation.

We have averaged about fourteen inches for the anterior method, and since the unfortunate termination of the case referred to not less than ten inches for the posterior. Meyer reports a case in which 15 c.c. proved to be too short for convenience at a secondary operation. Peterson, from the Heidelberg clinic, has studied the anatomy of gastro-enterostomy, and calls attention to the fact that the origin of the jejunum is at a higher level than the site of the anastomosis in the posterior operation. This would place the proximal portion of the jejunum above the opening, and he believes that the absence of pernicious vomiting in the cases in Czerny's clinic is due to this cause, although it is evident that the location of the opening on the posterior wall of the stomach must in these cases have been at an inferior point, and it is probable that the advantage may lie in this feature of the operation. If the obstruction at the pylorus be permanent there can be no objection to the short length of jejunum above, but, if an open pylorus threatens contraction and spur formation, this may prove unfortunate. The last complication to be briefly referred to is the possibility of the small bowel passing through the loop of intestine above the anastomosis. This danger is much greater with the anterior than the posterior method. Case V. so well illustrates this condition as to need no further comment.

Case V. *Anterior gastro-enterostomy; secondary operation for the relief of a twist at the anastomotic opening caused by small intestine passing through the loop.*—R. N. S., aged forty-one years, American, barber. Admitted to St. Mary's Hospital January 1, 1901, with the following

history: For several years has suffered from attacks of burning pain in the epigastric region, lasting for a few minutes at a time, but recurring at intervals of several hours. Much worse when at work at his trade. These "cramps" would last in this way for several weeks at a time, after which there would be an interval of weeks or months of good health. For several months has had more or less stomach trouble, and occasionally vomited the contents of the stomach. The distress has caused him to eat sparingly, and he has lost twenty-five pounds in weight. He had an attack of appendicitis, with an abscess, some years ago; the latter had been incised, but the appendix was not removed. He has had a right inguinal hernia for many years.

Examination. A spare man, six feet and one inch in height, emaciation noticeable; with the exception of the stomach no features of interest. Painful point in epigastrium. Free acid. Greater curvature of stomach three inches below the umbilicus. Diagnosis: Pyloric obstruction from ulcer.

January 2d. Anterior gastro-jejunostomy, Murphy button, appendectomy and Bassini operation on hernia. An ulcer existed at the pylorus, extending on to the lesser curvature, irregular contour, size of last phalanx of forefinger. Evidently partially cicatrized and obstructing pylorus. Fourteenth day, symptoms of intestinal obstruction lasting forty-eight hours. Condition relieved by gastric lavage and rectal feeding. Button passed on the sixteenth day; evidently cause of symptoms. Discharged January 18th, gained rapidly in weight and strength. For a year remained in good health, although complained that if he stood erect he had a "drawing feeling" in his stomach. From this time to May 14th, when he was readmitted to the hospital, he had slowly developed all of the former symptoms of obstruction at the outlet of the stomach and a constant pain in the abdomen, centring below the umbilicus. May 15th abdomen opened. Gastro-jejunal orifice nearly obliterated, and stretched to an inch in length. Jejunum twisted at the site of anastomosis one-half turn from the left to the right. Somewhat more than one-half of the small intestine had passed through the loop of jejunum between the origin of the jejunum and the attachment to the stomach. The point of entrance was on the right side beneath the transverse colon. The traction weight of the intestines upon the mesentery at the inferior margin of the loop had caused the volvulus. The mesentery at this point was much thickened. The intestines were replaced. The gastro-

jejunal fistula divided and the opening into the stomach closed. The opening into the jejunum was enclosed by a purse-string suture, and the half of a Murphy button was introduced and a posterior gastro-jejunostomy made. The pyloric stricture was nearly complete, and the ulcer evidently cicatrized. It is probable that the piece of jejunum immediately below the anastomosis passed through the loop first, producing the twist which was so prominent a feature on opening the abdomen. As to when this happened it is hard to tell, probably not for some months after the operation. When the process once began it might be expected to continue until such an amount of intestine travelled over the loop as to pull the mesentery taut, the symptoms increasing as the condition gradually developed. It is possible that at the time the juncture was affected a slight twist might have occurred.

A NEW METHOD OF PYLOROPLASTY.

By J. M. T. FINNEY, M.D.,
BALTIMORE.

The first plastic operation for the relief of a benign stricture of the pylorus was performed by Heinicke in 1886. A few months later Mikulicz made use of exactly the same procedure, being at the time in ignorance of the work of Heinicke. This operation has since borne the name of these two surgeons.

Before discussing the relative advantages and disadvantages of their particular method, a word or two concerning other operative procedures designed to accomplish the same result will not be out of place.

The methods used in the treatment of non-malignant stricture of the pylorus seem, all of them, open to certain special objections. Digital or instrumental divulsion of the pylorus, whether by the method of Loreta or Hahn, has proven very unsatisfactory as judged both by immediate risks and final results, and has been practically abandoned.

Jaboulay, in 1892, proposed the operation of gastro-duodenostomy. Modifications of this method have been suggested by Duranti and Henle, but it has never met with much favor on the part of the profession. This operation I performed three years ago in a case of pyloric stricture from old ulcer. The condition of the patient, an old lady, has been improved, but not entirely relieved. It was the partial failure in this case that led me to seek a better method.

The operation of pylorectomy, on account of the greater technical difficulties and increased danger in its performance, must of necessity remain of limited usefulness. Theoretically, of course, it is the ideal operation, but practically, except in rare instances, malignant disease is its sole indication.

Gastro-enterostomy, devised by Nicoladoni in 1881, seems at the present time to be the operation of choice with the majority of surgeons, and the weight of surgical authority is decidedly in its favor.

But as to the relative merits or demerits of this operation, performed by whatever method, there still exists among surgeons great diversity of opinion. Call it by whatever name you will, explain it as you may as being due to the reflux of bile into the stomach, or as resulting from the presence in the duodenum of particles of partially digested food, the fact remains that the "circulus viciosus" of the Germans is present in a not inconsiderable percentage of cases, and when it does occur it is productive of much discomfort to the patient as well as being a grave menace to the success of the operation.

While it is undoubtedly true that for some reason or other this percentage varies much in the hands of individual operators of large experience, still in the aggregate the danger and suffering from this source are so great as to make it well worth while to eliminate it altogether if it were possible. The great desideratum, of course, is to establish an opening between the stomach and bowel which will remain patulous, and through which at the same time the bile and stomach contents will not tend to regurgitate.

From a careful study of the subject it would seem that the Heinicke-Mikulicz operation, while having in selected cases definite advantages over any other operation, still has certain recognized objections. Attempts to overcome these defects have been made by several operators. Richardson, of Boston, advocates an oval- or diamond-shaped incision through the pylorus, which accomplishes the excision of the anterior portion of the stricture and leaves only the posterior wall as a hinge upon which the duodenum and stomach are brought together. Mayo Robson speaks with favor of this method, and Morrison has recently reported several cases in which he has made use of the same procedure with success. Koeppelin and Jaboulay recommend what they call "submucous pyloroplasty," in which the incision is carried down to but not through the mucosa. The divided serous, muscular, and submucous coats are then united in the usual way. They maintain that this modification is safer than the original method, the danger of sepsis being done away with. Enough cases, however, have not been reported to determine its usefulness, and it would seem, theoretically at least, of doubtful utility. Mayo Robson advocates the use of an "internal splint in the shape of a bone bobbin, over which to apply the sutures," a method which, he states, has been employed in all his operations, and one which offers several advantages, for instance: "Only two continuous sutures are required for the mucous and peritoneal margins, respectively. The bone tube secures an immediate and thoroughly patent channel which affords protection for from twenty-four to forty-eight hours to the line of sutures, by

FIG. 1.

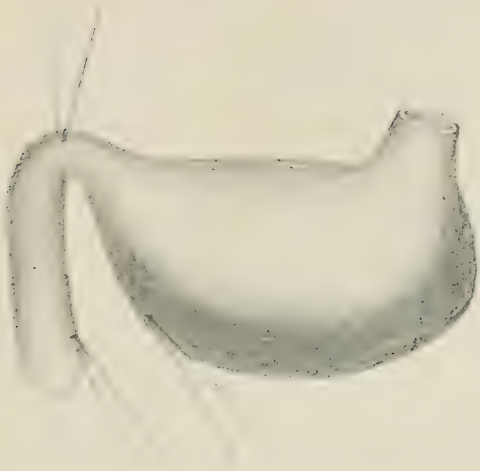


FIG. 2

which time union should be established. And it prevents the new channel being inadvertently made too narrow." This modification has been followed by other surgeons with success.

The operation which I propose is practically a modification of the method of lateral anastomosis suggested by Dr. Halsted. I have performed the operation five times. In all of my cases the pylorus was more or less adherent to the surrounding structures; abdominal wall, liver, gall-bladder, omentum, and colon. In all the cases the operation was carried out, notwithstanding the adhesions and thickened walls of the pylorus and stomach, with entire satisfaction, and in all the cases the result has been complete relief from all unfavorable symptoms. Three cases were operated upon over a year ago; the fourth case three months since, and the fifth case only three weeks. The operation is as follows:

Divide the adhesions binding the pylorus to the neighboring structures, also free as thoroughly as possible, the pyloric end of the stomach and first portion of the duodenum. Upon the thoroughness with which the pylorus, lower end of the stomach and upper end of the duodenum are freed depends in large measure the success of the operation and the ease and rapidity of its performance. I wish to emphasize this as one of the most important points in the operation. Frequently at first sight the pylorus may seem hopelessly bound down, when, after a little patient toil and judicious use of the scalpel and blunt dissector, it is found that it can be freed with comparative ease. A suture, to be used as a retractor, is taken in the upper wall of the pylorus, which is then retracted upward. A second suture is then inserted into the anterior wall of the stomach, and a third into the anterior wall of the duodenum at equidistant points, say about 12 cm. from the suture just described in the pylorus. These second sutures mark the lower ends of the gastric and duodenal incisions, respectively. They should be placed as low as possible in order that the new pylorus may be amply large. Traction is then made upward on the pyloric suture, and downward in the same plane, on the gastric and duodenal sutures. This keeps the stomach and duodenal walls taut, and allows the placing of the sutures with greater facility than if the walls remained lax (Fig. 1). The peritoneal surfaces of the duodenum and stomach along its greater curvature are then sutured together as far posteriorly as possible (Fig. 2). For this row I would recommend the use of the continuous suture, as it is more easily and quickly applied, and it can be reinforced after the stomach and duodenum have been incised. After the posterior line of sutures has been placed an anterior row of mattress sutures is taken, which are not tied, but left long, in the

manner indicated in Fig. 3. These sutures, after they have been placed, are retracted vertically in either direction from the middle of the portion included in the row of sutures (Fig. 4). Then, after all the stitches have been placed and retracted, the incision is made in the shape of a horseshoe. The sutures should be placed far enough apart to give ample room for the incision. The gastric arm of the incision is made through the stomach wall just inside the lowest point of the line of sutures, and is carried up to and through the pylorus and around into the duodenum, down to the corresponding point on the duodenal side. Hemorrhage is then stopped. It is well to excise as much as possible of the scar tissue upon either side of the incision in order to limit as far as possible the subsequent contraction of the cicatrix. This procedure I carried out in two of my cases with great satisfaction, and I should strongly recommend it in all cases where the walls of the pylorus are much thickened and there is much scar tissue present. It is well, too, to trim off with scissors redundant edges of mucous membrane in order to prevent the formation of a valve-like fold of mucous membrane at the new pylorus. A continuous catgut suture is now taken through and through all the coats of the intestine on the posterior side of the incision (Fig. 5). This reinforces the posterior line of sutures, secures better approximation of the cut edges of the mucous membrane, and prevents the reunion of the divided intestinal walls. The anterior sutures are then straightened out and tied and the operation is complete, unless one wishes to reinforce the mattress sutures with a few Lembert stitches (Fig. 6). This procedure, as is readily seen, gives the minimum of exposure of infected surface. All the stitches are placed and the posterior row tied before the bowel is opened, and it remains open just long enough to control the hemorrhage. The size of the newly formed pyloric opening is limited in this operation only by the mobility of the stomach and duodenum and the judgment of the operator. In all of my cases the incision has been about 15 cm. in length, and could have been made longer had I chosen to make it so. Unless the stomach is very much dilated or has descended to an unusual extent, the lower limit of the new outlet is at or near the level of its most dependent portion.

When the stomach is much dilated there is no contraindication in this operation to the performance at the same time of gastropexy or gastroplication, if one considers them indicated.

In the matter of mortality, statistics, notoriously unreliable in cases of this sort, seem to slightly favor pyloroplasty as against gastroenterostomy. But, nevertheless, the latter operation numbers among its staunchest advocates some of the foremost names in the surgical

FIG. 3.

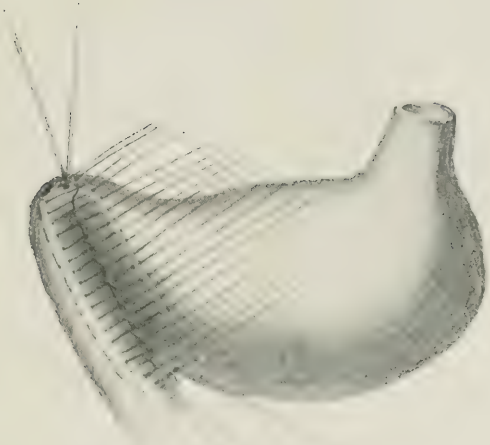


FIG. 4.

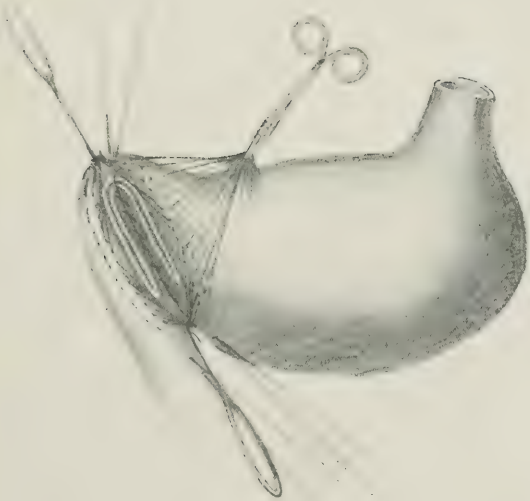


FIG. 5.

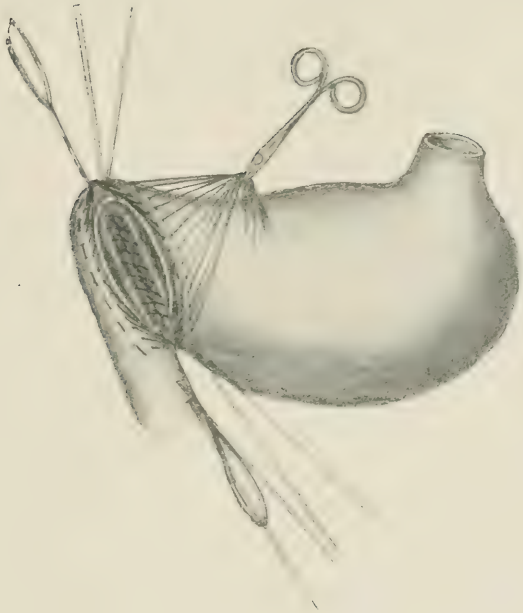
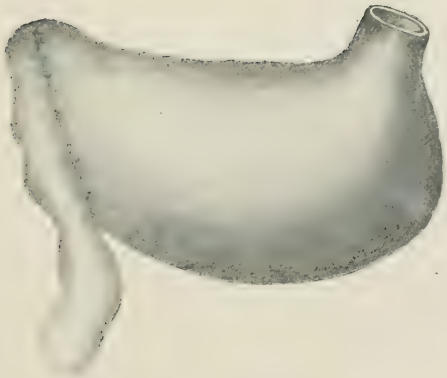


FIG. 6.



world. Furthermore, it cannot be denied that during the past few years the operation of pyloroplasty has fallen somewhat into disfavor, partly because of the number of recurrences following it, and partly because of the improved methods recently introduced and the increased facility in performing the operation of gastro-enterostomy. Mechanical devices, such as the Murphy button and the bone bobbin of Mayo Robson, have contributed not a little to the accomplishment of this result. The range of usefulness of gastro-enterostomy is, of course, much wider than that of pyloroplasty, which, obviously, must be restricted to cases of benign stricture of the pylorus, although Morrison reports a case of early carcinoma of the pylorus treated in this way through mistaken diagnosis, with a result quite as satisfactory as that usually obtained by more radical methods.

The special objections that have been urged against the Heinicke-Mikulicz operation are:

1. Its inapplicability in cases of extensive and firm adhesions about the pylorus.

2. Its inapplicability in the presence of still active ulceration.

3. The liability to recurrence of the stricture due to contraction of the scar.

4. The inability to obtain good apposition on account of rigidity of the walls of the stomach and duodenum.

The outlet of the stomach is not placed at the most dependent portion, hence in the presence of motor insufficiency the aid of gravity in emptying the stomach is lost.

The effect of some of these objections to the operation is lessened by the modifications suggested by Richardson, Morrison, and others, to which reference has already been made, but the validity of the others has been established by repeated observations.

I believe that all of these objections—with the possible exception of the second, viz.: still active ulceration—are overcome by the method here suggested. I am convinced that adhesions, however firm or extensive, constitute no bar to this operation. With care and perseverance they can be separated. If the new pylorus is made sufficiently large, the danger of subsequent contraction is reduced to a minimum. Excision of the anterior portion of the thickened pylorus and, if necessary, the adjacent portions of the gastric and duodenal walls, lessens materially the danger of subsequent contraction, and at the same time allows of easy approximation of the two surfaces.

In an extremely interesting monograph by Carle and Fantino, the functional results following the operations of gastro-enterostomy and

pyloroplasty are compared. Robson summarizes their findings briefly as follows:

"*Points in Favor of Pyloroplasty.*

"1. Regurgitation of bile into the stomach is prevented.

"2. Secretion of hydrochloric acid, when it has been excessive, becomes normal.

"3. If the secretion of hydrochloric acid has been diminished or absent before the operation, it remains in statu quo after operation.

"4. If there has been primary gastric atony, peristalsis is but little improved.

"5. This function improves rapidly or reaches perfection if the muscular contractility has been normal or increased, and when the obstruction was due to fibrous stenosis or pyloric spasm.

"6. In all such cases evacuation of the stomach is accomplished in its physiological period. Only in rare cases, and these only in the first months after operation, may it be delayed.

"7. The capacity of the stomach always decreases, but rarely becomes as small as normal.

"8. The pylorus recovers tone.

"*Points of Difference Between the Results of Pyloroplasty and Gastro-enterostomy.*

"1. The absence of regurgitation of bile, and hence the absence of any biliary influence on the gastric secretions.

"2. The evacuation of the stomach is not accelerated; hence the difficulty the stomach has in reaching its normal size.

"3. The slight or negative result obtained by pyloroplasty in obstruction from primary gastric atony compared to the positive results from posterior gastro-enterostomy."

A word as to the preparation of patients for this operation. Accumulated clinical experience has proven that it is unnecessary, and often harmful, to put patients through a long course of preliminary treatment. The observations of Cushing, in the Johns Hopkins Hospital, upon the bacteriological examination of the stomach contents show that cleansing the mouth and teeth carefully with antiseptic washes, and the administration of sterile food only, will quickly render the stomach contents innocuous. The treatment carried out in all of my cases was as follows:

For two or three days before the operation the mouth and teeth were carefully cleansed with carbolic solution, and only sterile liquid food and water administered. The stomach was irrigated night and

morning and just before operation with boiled water. No food at all was given by mouth for the twelve hours preceding operation. Cultures were taken from the stomach contents in three of the cases, and two were found to be sterile. The skin preparation is the same as for all abdominal cases. I prefer the incision through the right rectus muscle, and make it sufficiently long to give abundant room, say six to eight inches. The greatest care is exercised in protecting the abdominal cavity from soiling by extravasated stomach contents, by the liberal use of Mikulicz's pads of sterile gauze. In two cases Schleich's solution and 1 per cent. solution of cocaine were made use of, but ether had to be substituted in small quantity toward the close of the operation. The abdominal wound is closed without drainage. Nothing is given by mouth for the first thirty-six to forty-eight hours. Enemata of salt solution and coffee are given every five hours, for the first twenty-four hours, after which time nutritive enemata are alternated with the salt solution. Water in small quantities is allowed early. On the second or third day albumin in teaspoonful doses is administered, and if borne well, broths and milk are rapidly added.

Patients, particularly weak ones, are not required to lie flat on the back, but are encouraged to turn, and even allowed to be propped up in bed very soon after the operation.

Miss Emily P., referred to me by Dr. Dunott, of Baltimore, a student, aged twenty-one years, entered the Union Protestant Infirmary February 23, 1901, complaining of "stomach trouble." Her family history is negative. She had always been healthy until her present illness began, two and one-half years ago, with severe indigestion, which culminated in a severe attack of nausea and vomiting, which lasted for some days. Since that time she has always had more or less abdominal distress, and has seen many physicians, with little or no relief. Her attacks seemed at times to be aggravated by partaking of food, at other times not.

Vomiting was copious and severe; nausea almost constant. She has never vomited blood except after the use of the stomach-tube. Has lost about fifteen pounds recently, looks pale, anæmic, and somewhat emaciated.

Heart and lungs normal. Abdomen slightly distended. Stomach tympany greatly increased. Succussion pronounced. Palpation negative, except slight tenderness and muscle spasm over the right hypochondrium. Patient had been operated upon about three months previously by Dr. Dunott. The abdomen had been opened; some induration was found about the pylorus; the gall-bladder was adherent

to it. There was a scar, apparently of an old ulcer, in the anterior wall of the stomach near the pylorus, and the anterior wall of the pylorus was folded upon itself, making a partial stricture.

The adhesions were separated, and the pyloric wall unfolded as much as possible, when the stricture of the pylorus seemed to be relieved. The stomach was not opened. There was a second scar, also, in the anterior wall of the stomach near the pylorus. Her abdominal wound was closed without drainage. She made a good recovery from the operation, but experienced little or no benefit from it, and returned, as before stated, about three months later, for a radical operation.

On opening the abdomen it was found that the omentum was very adherent to the pylorus and to the scar of the previous operation. The gall-bladder was also very firmly adherent to the pylorus and duodenum. The stomach was found to be greatly dilated, and scars of old ulcers were apparent near the pylorus. The pylorus itself was found much thickened. After freeing all the adhesions, the anastomosis between the stomach and duodenum was accomplished. The pylorus was found to be much contracted, the orifice being less than 1 cm. in diameter.

She made an excellent recovery, and reported a few days ago that since the operation she has been absolutely free from any of her former trouble. At an examination a few weeks ago the stomach had diminished to about the normal size. She has gained markedly in weight.

Mrs. Anna S., aged fifty-five years, entered the Union Protestant Infirmary, March 16, 1901; referred to me by Dr. J. Friedenwald, of Baltimore, complaining of indigestion and "stomach trouble."

Family history negative. Her trouble dates back about a year. Symptoms have been very severe for about six months past, during which time nausea, vomiting, constipation, and loss of weight have been very pronounced.

She has never vomited blood. Has been unable to eat anything but liquid food, milk, and crackers. Vomits frequently large quantities. Her only relief is from the daily use of the stomach-tube. She has lost forty pounds in the last six months. Examination of the patient shows an exceedingly emaciated, somewhat anæmic-looking woman. Heart and lungs negative. Abdomen considerably enlarged. Liver dulness normal. Stomach tympany much increased. Muscle spasm and tenderness on palpation over the pylorus, otherwise negative.

Dr. Friedenwald had the patient under observation for some time, and examined the stomach contents repeatedly. There was marked

hyperacidity. On March 19th the abdomen was opened in the usual way, and a number of adhesions were found about the pylorus, which was fairly movable. After freeing the adhesions the usual operation was carried out very satisfactorily. The patient, although not in very good condition at the time, stood the operation very well, and made a rapid and complete recovery.

I saw her a few days ago. She had regained her forty pounds, and was looking the picture of health. She said she ate anything and everything, and digested it with no difficulty.

Mary M., aged twenty-eight years, entered the Johns Hopkins Hospital, April 12, 1901, referred to me by Dr. Friedenwald, of Baltimore, complaining of "stomach trouble."

Family history negative; no tuberculosis or cancer. History of trouble dates back twelve years, during which time she has suffered always more or less after eating. No appetite. Very constipated. No history of injury. Her chief complaint is distress after eating, occasional attacks of bloating of stomach and vomiting, with pain. Epigastric distress increased by food, relieved by vomiting. Pain radiates to back and right side. Two years ago had severe hemorrhage. Vomitus occasionally suggests coffee-grounds. Has lost thirty pounds in weight. Is very weak, and for the last two years has lived on milk, soup, and crackers. She has used the stomach-tube for the past year daily.

Patient is very thin, pale, and anæmic looking. Heart and lungs normal. Abdomen not distended. Slight tenderness over epigastrium.

Area of gastric tympany increased. Liver dulness normal. Palpation negative.

She had been in the Johns Hopkins Hospital two years previously, Then an exploratory laparotomy had been performed by Dr. Halsted.

The organs all seemed normal at that time, no thickening about the pylorus. A longitudinal incision was made in the anterior wall of the stomach near the pylorus, through which the mucous membrane was examined, and no lesion found. No apparent contraction of the pylorus. Stomach wound was closed; no drainage.

She was relieved of her symptoms for about one year. Eighteen months later she entered my service at the Union Protestant Infirmary. Her condition at that time was about the same as before the operation. I opened the abdomen, expecting to do a gastro-enterostomy. I found many adhesions about the pylorus and lower end of the stomach, which doubled it in upon itself and decreased the lumen

markedly. After these adhesions had all been separated I invaginated the anterior wall of the stomach on my finger and passed it through the pylorus, which seemed about the normal size. I could dilate it easily. The stomach not being noticeably enlarged, it seemed as if the development of adhesions after Dr. Halsted's operation had been responsible for the return of the trouble. I, therefore, having stretched the pylorus thoroughly with my finger, after the method of Hahn, closed the abdominal wound without drainage.

She was again relieved of her symptoms, but only for a few months, and re-entered the Johns Hopkins Hospital on April 12, 1901, for a radical operation. Her condition at that time has been described. On opening the abdomen a great mass of adhesions was encountered, binding together the liver, stomach, duodenum, omentum, and parietal peritoneum. Considerable time was consumed in separating these adhesions, during which hemorrhage was quite free, but easily controlled by pressure and ligature. The pylorus was bound up in adhesions to the omentum, gall-bladder, and liver. The left lobe of the liver was thinned and very adherent to the anterior surface of the stomach. The pylorus was quite indurated and thickened. The stomach was considerably dilated.

After freeing all the adhesions, the stomach and duodenum were brought together and an anastomosis established between them in the manner described.

Notwithstanding the many and dense adhesions and the thickness of the walls of the pylorus, the operation, once the adhesions had been separated, was accomplished without further difficulty.

She made a good recovery, and is now completely relieved of her trouble. I saw her a few days ago, and she had gained about forty pounds, and says she eats and digests anything she wishes.

J. M. B., referred to me by Dr. J. Friedenwald, of Baltimore, aged forty-eight years; barkeeper; admitted to the Johns Hopkins Hospital March 18, 1902, with the history of "stomach trouble" for years, and a piece of stomach-tube having broken off in the stomach during the act of washing out.

Family history negative, no tuberculosis, no cancer. Patient has had the usual diseases of childhood, typhoid fever, pneumonia, very subject to colds, has had a cough, now, for four years. Has been a very hard drinker. The patient gives the history of having had indigestion and "stomach trouble" for twenty years. Began with pain and vomiting after eating. Has been very severe at times, radiating to back and right shoulder-blade. Eighteen years ago had severe

hemorrhage from stomach. He has had a great deal of trouble ever since that time, frequently vomiting food that has been in his stomach for several days. He has been under treatment during most of the time, having consulted many physicians. Bowels irregular.

About three years ago, by the advice of his physician, he began the use of the stomach-tube, but discontinued it after a time. Eleven days ago, while using an old tube that he had had for five years, it broke, and more than half of it remained in the stomach. The patient insists that during the time this piece of tube has remained in his stomach he has been feeling better than for years past.

Examination of the patient shows an extremely pale and emaciated man. In the chest there are indications at both apices of beginning tubercular trouble. Heart negative. Abdomen rather full, considering the extreme emaciation; liver dulness about normal. Stomach tympany extends over 1 cm. below the umbilicus and well beyond the middle line. Palpation of the abdomen negative. No movable dulness detected. Marked œdema of both legs. Finger-nails markedly clubbed.

On March 19 abdomen was opened under Schleich's solution anæsthesia. There was considerable ascitic fluid in the peritoneal cavity.

The stomach was found to be much enlarged and displaced downward. Liver about normal in size, rather hard, with some scar tissue over the pylorus. Gall-bladder slightly distended, but not adherent. The pylorus was very much scarred and puckered, its walls much thickened and indurated. It was very adherent to the liver and transverse colon. The omentum was tightly bound to it in several places. The pylorus itself was so firmly fixed by the adhesions from below that it was impossible to raise it but slightly. The duodenum was adherent near the pylorus, but free below. It was found possible to bring together the stomach and duodenum after freeing the adhesions about the pylorus. The operation of pyloroplasty was then performed in the way already described. It differed only in that the incision was made considerably longer, about 15 cm. in length. The dense scar tissue in the anterior wall of the pylorus and the neighboring portion of the stomach was excised. The wall of the stomach at this point was very dense and firm, and over 1 cm. in thickness. A portion of stomach-tube, about 35 cm. long, was found in the stomach and removed.

There was no difficulty in applying the sutures, and the operation was carried out with great facility. The whole procedure occupied about fifty minutes.

The patient stood the operation well, and up to the present time has been doing uninterruptedly well, and has gained fifty pounds.

J. A. W., aged twenty-two years, referred to me by Dr. L. P. Hamburger, of Baltimore. A farmer by occupation. Admitted to the Union Protestant Infirmary May 23, 1902. Complains of burning and a sense of weight in the stomach. Several paternal aunts were afflicted with consumption. No history of tumor. Does not use alcohol or tobacco.

Present illness began three and a half years ago with the grippe. Following this illness, he was left weak. During the summer of 1898 he belched much, and regurgitated his food. Up to November, 1898, lost about ten pounds. At this period he gave up work because of weakness and a "pulling" sensation in the abdomen. The winter of 1898–99 he spent in the Maryland General Hospital, and has gone the rounds of hospitals and doctors ever since, without improvement. In the spring of 1898 weighed 140 pounds, and in the spring of 1899 weighed 105 pounds. Because of the burning sensation in the abdomen he was obliged to limit his diet since 1899 to eggs, milk, cocoa, and toast. Complaint has continued off and on in varying intensity ever since. In addition, he is compelled to expectorate saliva almost continually. Has never vomited blood. He is worse in the summer, and there is a slight improvement in the winter. His average weight now is 127 pounds. His appetite is good, but any increase in his diet causes diarrhœa.

On physical examination, patient is very poorly nourished, tongue lightly furred, mucous membrane fairly good color. Patient blushes readily.

Heart and lungs clear. Temperature, 99°. Abdomen looks natural. Distinct clapotage in the left hypochondrium. The right kidney is distinctly palpable. Outline of stomach tympany on inflation from left nipple to 3 cm. below umbilicus.

Ewald test-meal. Free hydrochloric acid, no lactic acid.

On May 30, 1902, I performed the operation of pyloroplasty by the method described. On opening the abdomen, the stomach was found to be slightly dilated and its walls quite flabby. At the pylorus, on the anterior wall was found a puckered scar of an old ulcer. The pylorus would not admit the tip of the index finger. Posteriorly, there were some adhesions between the stomach and duodenum. After these had been thoroughly freed, the operation, as described, was carried out after having excised the scar tissue just referred to in the anterior wall of the stomach.

The appendix was found very long, and bound down by adhesions on the anterior surface of the ascending colon, the tip of the appendix being adherent to the gall-bladder. The appendix was excised.

The patient has made an excellent recovery, and at the present time, one month after the operation, he has gained several pounds; is eating and digesting regular hospital diet, and expresses himself as being very much relieved.

From my study of the other methods suggested for the relief of benign stricture of the pylorus, and from my experience in the foregoing cases, I believe the following conclusions are justified:

1. All the operations heretofore suggested for the relief of benign stricture of the pylorus are open to serious individual objections.

2. The operative procedure made use of in the cases here reported combines more good points and less objectionable features than any other method that has been suggested up to the present time.

Bibliography.

Heinicke. Inaug. Dissert., Furth., 1886.
Mikulicz. Archiv für klinische Chirurgie, vol. xxvii. p. 79.
Jaboulay. Province Médicale, Lyon, 1894, vol. viii.
Duranti. Quoted by Mikulicz.
Henle. Centralblatt für Chirurgie, 1898, vol. xxix.
Wolfler. Ibid., 1881, vol. xiv.
Richardson. Boston Medical and Surgical Journal, November 30, 1899.
Robson. Diseases of the Stomach, Robson and Moynahan, New York, 1901.
Morrison. British Medical Journal, August 25 and October 6, 1900.
Koeppelin. Lyon Médicale, September 24, 1899.
Halsted. Johns Hopkins Hospital Bulletin, January, 1891.
Carle and Fantino. Archiv für klinische Chirurgie, Bd. xlvi. p. 1.
Cushing. Johns Hopkins Hospital Reports, vol. ix. p. 543.

DISCUSSION.

Dr. M. H. Richardson, of Boston.

I have learned much from this very interesting paper. I hope in time to have better success in gastro-enterostomy than I have had thus far. My results have been distinctly bad—almost invariably bad—not to be compared with the results in pylorectomy, pyloroplasty, partial extirpation of the stomach, and total extirpation of the stomach. The reasons for these bad results have not been, however, far to seek, for I have always favored restoration of the natural outlet of the stomach whenever that operation was possible, even when the patient's general condition was not especially good. Gastro-enterostomy was, therefore, left for the unpromising and the severe cases. This reason alone would be sufficient to account for my bad results.

The methods that I have followed have been various. I have suited the operation to the case.

The immediate results have usually been good; but the patients have, in the course of a few weeks, had something go wrong with them. Persistent vomiting—vicious circle—has been the commonest complication.

In a recent case I have had a chance to see the comparative merits of gastro-enterostomy and pylorectomy. The patient was a man with stricture of the pylorus of doubtful nature. Exploration showed a thickening of the pylorus suggesting ulcer, but yet quite as likely to be a carcinoma. I had heard Dr. Mayo's paper read in Boston, and was particular in making the gastro-enterostomy to follow his directions as to the opening low in the anterior stomach wall. This patient, as well as the others, did well for a time, but with persistent vomiting, and gradually increasing in severity. I finally explored again. The gastro-enterostomy was perfect. The loop of intestine caused the stomach to sag into satisfactory dependent drainage. There seemed no reason why this operation should not have been as successful as any gastro-enterostomy. It was, however, a conspicuous failure. I resected by a broad margin the diseased pylorus, and applied a circular suture. The patient made a good recovery, and has gained some sixty pounds. His stomach works well, and he is able to attend to his business. Though the gross appearances were not characteristic, the microscopical report by Dr. Whitney was

cancer. This case, like many others in my experience, strongly confirms my choice for the restoration of the natural passages in diseases of the alimentary canal whenever it is possible to restore them.

Dr. Arthur Dean Bevan, of Chicago.

I have had a rather limited experience with gastro-enterostomy. Including my cases of pylorectomy, which I have made as a part of the operation of gastro-enterostomy, totaling about twenty cases as complications, I have had: (1) drowning of my patient during the operation because the stomach was not properly washed out; (2) pneumonia twice; (3) return of the carcinoma on about the fourteenth day in a case of gastro-enterostomy which had otherwise run a normal course; (4) death from exhaustion twice, and (5) resection on opening the abdominal wound on the twelfth day after the tissues were removed. This wound had been closed with silkworm-gut, and the patient is now apparently going on to recovery. I want to make one point in regard to the method of anastomosis. I prefer the suture to the button. With a little practice anyone can make a gastro-enterostomy in about fifteen minutes as far as the suturing is concerned. Peritonitis from insufficiency of the button has been almost eliminated in the clinics where gastro-enterostomy is largely done. The solution of the anastomosis has really been arrived at by using two rows of sutures, the first a light continuous suture and the second a simple Lembert suture. The first row acts as a hæmostatic suture, while the second row makes leakage impossible, and in this way the suture has the advantage over the button. I make my anastomosis at a low point, so as to prevent any difficulty before the complete anastomosis is made. I believe that the suture is much the better from a number of standpoints, especially in benign cases. In malignant cases it does not matter so much. As a rule, practically always, the operation is a simple one. In the benign cases the suture has the great advantage that no foreign body is left in the stomach. The results seem to show that in about 50 per cent. of the cases the Murphy button is retained.

As to the method mentioned by Dr. Finney, it seems to me that he is straining at a gnat and swallowing a camel to suggest such a complicated operation when we have at our disposal a very much simpler method of handling such a case—*i. e.*, the Kocher pylorectomy. In all cases of benign stenosis this would be a much simpler operation, could be done more rapidly, and is always possible wherever Dr.

Finney's operation could be done. Another criticism is against the uninterrupted suture which, in my opinion, has no place in intestinal or stomach surgery. The continuous suture has so many more advantages than any method of uninterrupted suture. It prevents leakage, controls hemorrhage, can be introduced very much more rapidly, and the tension is the same all the way around. I think we should dismiss absolutely any form of uninterrupted suture in stomach and intestinal work.

Dr. Willy Meyer, of New York City.

I have done gastro-enterostomy about thirty times by both the anterior and posterior methods. I have used the suture, Murphy button, and McGraw's elastic ligature. I have yet to see my first case of vicious circle.

There can be no doubt that posterior gastro-enterostomy is more anatomical and more physiological; the parts remain after the operation in their normal relation, at least this is the impression the surgeon gets after he has pulled the jejunum over the omentum and transverse colon in order to anastomose it to the anterior gastric wall. Now we hear from Dr. Mayo that the intestines may slip through this loop. Surely, wherever posterior gastro-enterostomy can be done it should be carried out; but there are cases where it is impossible, as for example where the transverse mesocolon is very short. Sometimes even this complication still permits of doing posterior gastro-enterostomy, provided the stomach wall is not too much thickened. I never hesitate in such cases to pull a good portion of the stomach even through a narrow slit of the transverse mesocolon and then stitch the borders of the latter to the stomach pouch with a number of sutures in order to avoid subsequent contraction. It is evident that anterior gastro-enterostomy gives more comfort to the surgeon. The field of work is right in front of him, and the parts can be pulled out in front of the abdominal incision.

In a number of cases I have seen the button drop into the stomach. So far as I know it has never done any harm there. I have a man who was operated on in 1897 who is still well, although carrying the button in his stomach, as proved by the rays.

This accident may be avoided by using a button with two flanges, as proposed by Weir. The complications that may arise after gastro-enterostomy are sepsis, shock, and contraction of the transverse meso-

colon; they can all be avoided or overcome. A fourth complication is represented by the vicious circle. Personally I have not seen it as yet. I have seen frequent vomiting, which was, however, always overcome by thorough lavage of the stomach; but we must admit that the vicious circle does exist, and may set in in any one of our patients thus operated upon.

The means to avoid its appearance is to add entero-enterostomy to the gastro-enterostomy. This addition is not of great moment, especially not if we make use of the elastic ligature as proposed by Dr. McGraw. It is true, we have no specimens as yet that prove in the human subject the permanency of the anastomosis thus made; but we shall have some soon. Personally I do not expect to find any more contraction of the anastomotic opening, if done by the elastic ligature, than by any other method. If a surgeon has a preference for using the suture or the button he should do so in his gastro-enterostomy; but he will be wise, it seems to me, always to add entero-enterostomy by means of the elastic ligature rather than to be called upon soon to reopen the abdomen for the sake of relieving a vicious circle. Such a procedure would mean, I think, a progress in treating this class of cases.

Dr. M. L. Harris, of Chicago.

I do not believe there is any material advantage in favor of the anterior or posterior method, but what little advantage there is is in favor of the posterior operation, as the stomach dilates more at the expense of the posterior wall than the anterior. [Blackboard demonstration.]

This fact was made very apparent to me a short time ago by the case of a little lad, aged six years, who was shot, the bullet passing through from before backward. The shooting occurred after a hearty meal. When the abdomen was opened the contents of the stomach were found distributed throughout the peritoneal cavities, but there was no opening in the anterior wall of the stomach. There was, however, a perforation through the omentum, and two bullet wounds in the posterior wall. The bullet had passed through the posterior wall of the stomach twice from one to one-and-a-half inches apart. The stomach had dilated more at the expense of the posterior wall than the anterior. What little advantage there is is in favor of the posterior anastomosis, as the anastomosis thereby reached the most inferior portion of the stomach when dilated.

Dr. Albert Vander Veer, of Albany.

The paper by Dr. Mayo is a very valuable one, and as I look back and remember my first case of gastro-enterostomy, many years ago, I recall having made an anastomosis between the beginning of the ilium and the anterior wall of the stomach, but my patient was not particularly benefited, remaining well for three or four months, when he began to vomit. The next method that I employed, and which resulted favorably, was an anastomosis with a Murphy button. This can be done very quickly, and the so-called vicious circle I have not seen since doing a direct anastomosis in this manner. I have done this a number of times in the class of cases where the carcinoma is located in the posterior wall of the stomach, and where the patients have been under medical treatment for some time. The physicians have relied upon feeling the tumor before referring the case to the surgeon, and in this class of cases of carcinoma on the posterior wall I could do no more than a palliative operation, but I have found excellent results from this method of gastro-enterostomy. I am strongly in favor of Dr. Mayo's suggestion to anastomose to the posterior wall, and Dr. Bevan has shown this to be true. When I do this operation I sometimes use the Murphy button. I believe the operation can be done as quickly with the continuous suture, and as you can make a good closure it controls hemorrhage. I have no reason to regret this method. These are just a few points that present themselves to me at this time in reference to my later work, and my patients have usually been made more comfortable by the operation. As to the question of ulcer at the pyloric end of the stomach, if you can be quite sure that it is non-malignant resection is the thing to do. Pyloroplasty is a much better operation, and is more in accord with retaining anatomical structures, as you can make a clean removal of the growth with usually favorable results.

In reference to Dr. Finney's paper, I should want to study it pretty carefully and also his illustrations before acting upon it. It does not seem quite as simple as some of the operations we have been doing. His paper is a valuable contribution, and I shall study it carefully.

Dr. Frederick Kammerer, of New York City.

For the last four or five years I have done the posterior operation in about thirty cases, and I can say that my results since I have done this operation with the Murphy button have been much better than

when I did gastro-enterostomy. From my own personal experience I should unhesitatingly proclaim the posterior operation the better one. In former years I have done the anterior operation, using Senn's plates, Abbe's rings, the Murphy button and the running suture. I have always tried to place the opening in the stomach as low as possible near the large curvature, but the results have been very poor. Since the adoption of the posterior operation, according to Carle's and Fantino's method without the use of purse-string sutures, I have never had a single case that gave me trouble from regurgitation. In all but two instances my results have been excellent, those two cases dying from exhaustion. I have never seen contraction of the anastomotic opening. As to Dr. Bevan's condemnation of the interrupted suture, I do not quite agree with him. I think, generally, a continuous suture will give as good an adaptation of the surfaces as the interrupted suture, but when I have the time and can apply interrupted sutures in intestinal work, I always prefer to do so, and in gastro-enterostomy I think the continuous suture has certain disadvantages. In applying it, for instance, in the anterior operation I have noticed that the first row on the posterior circumference of the opening becomes rather loose upon incising the stomach and the small intestine. When the second running suture is then applied to bring together the cut surfaces of the intestines, the first continuous suture (the Lembert suture), which has been previously applied, is, as I have said, apt to loosen, more especially if the anastomotic opening has been made very large, as it should be when we are not using the button. I have myself lost a case in former years through leakage at this point.

Dr. Robert F. Weir, of New York City.

I have had some thirty to thirty-five cases of gastro-enterostomy, including five cases associated with pylorectomy, and of these the first seven or ten cases died from the obstruction known as the vicious circle. These openings were made anteriorly. I did one by the Kocher method which was not pleasingly borne, and since then all have been located posteriorly. In several of them I carried out Dr. Bevan's idea of attaching the jejunum at some length to the stomach, and in one case that came to autopsy where this had been done I found that it did not amount to much, for the stomach had doubled upon itself, and hence I was not disposed to carry out the procedure

any further. I then began to use the posterior opening more regularly, soon conjoining with it entero-anastomosis and placing it closer and closer to the lower border of the stomach. From that time on I have not had a single case of "vicious circle." I have had one death from the gastro-enterostomy done by this method, and that was where there was gastroptosis to a marked degree, so that in addition to the gastro-enterostomy I sutured the stomach to the liver and diaphragm. Leakage occurred from a too deeply placed suture. I may add as a matter of interest that that was a case not only of sinking down of the stomach, but one in which there was the rare condition of gastric tetany. Mention has been made of the button which I have used in a large number of my later cases with a little flange on each side, so that it would not go into the stomach. In one case it did get into the stomach, and it was partly my own fault in wrong suturing and partly the fault of the instrument-maker, as the two halves prematurely separated from a defective contact. In addition to using the button without safety sutures, as advised by Murphy, of which I have always felt a little suspicious, I generally use a number of supplementary sutures, and in this case I resorted to a good many. I believe I did wrong in this, while in other cases I have contributed somewhat to the delay in the retention of the button. However, this is a side remark.

As to the question of the mode of suturing, I always practice the continuous suture in the first row, and in the anterior second row the interrupted suture is employed. I have always thought that there was some weight in the objection raised to two rows of continued sutures, as with such a suture there is a greater possibility of interference with the circulation in the parts than there results from the interrupted suture. When the continuous suture is used, whether in intestinal or other work, several interrupted sutures are made along its course to guard against the giving way of the continued suture line.

Dr. Theodore A. McGraw, of Detroit.

I think, perhaps, of all men Dr. Mayo can show the best record for gastro-enterostomy. His idea of making the opening at the lower part of the stomach is a good one, notwithstanding that Kelling, after a series of investigations in reference to the physiological conditions in gastro-enterostomy, took the ground that it did not matter what part of the stomach you made your orifice the result would be the

same. He stated that the greater power of the stomach over the intestines was the cause for the food passing out of the stomach into the intestines. If the stomach was dilated and its muscular power was diminished so that the intestinal power became stronger than that of the stomach, the intestine would force the food into the stomach, and *vice versa*, so that gravity had nothing to do with it, as all of the contents of the abdomen are of about the same specific gravity. He may have been wrong in some of his conclusions, especially as gas in the stomach would make a difference, but I should like very much if I could get at the bottom of Dr. Mayo's success. My cases usually come to me when they are about dead, and they seek gastro-enterostomy as a last resort. I have never lost a case from sepsis, but always from exhaustion. They often come vomiting dark, black fluid, and they simply die. I have lost one case from a vicious circle which developed one week after the operation by elastic ligature. I found on post-mortem I had made the jejunum too short. I examined the effect of the elastic ligature on the human stomach and it showed the most beautiful orifice I have ever seen. The mucous membranes were brought together in a line that was barely perceptible. My second case occurred a few days after this, and the moment the symptoms of vicious circle appeared I opened the abdomen. I put in the elastic ligature, made an entero-anastomosis, and the man got well. I had intended to bring some specimens illustrating the way the elastic ligature is applied, but I was obliged to leave home earlier than I expected. They were sent to me, but have spoiled. I would like to urge upon you, gentlemen, to try them on the lower animals. It takes a little longer on the dog than on man. It is exactly in those cases where you have to save time that the elastic ligature may be made so quick, simply passing it through and through and tying it. I wish the Johns Hopkins people would have some experiments made with this ligature. [Blackboard demonstration.]

Dr. A. J. Ochsner, of Chicago.

I wish to say a word in connection with what Dr. Mayo has said, because I have the same class of cases to-day that I had five or six years ago, when I had abandoned gastro-enterostomy because my patients acted exactly like Dr. Richardson's and Dr. McGraw's. I thought my operation was done right, but it was not until I had the good fortune to see Dr. Mayo do the operation that I realized I was

theoretically right but practically wrong. Gastro-enterostomy simply means drainage. It has been suggested that one can draw conclusions from experiments upon dogs. There is a tremendous difference between the stomach of the healthy dog and the sick man, especially as in the latter you must count on gravitation. [Blackboard demonstration.]

I have my patients sit up the next day after the operation to aid in drainage. As to the other principles to which Dr. Mayo has referred, they are of the utmost importance. So long as the ulcer remains at the pylorus the latter remains closed, but as soon as the ulcer has healed the spasm subsides and the food passes through. If the lateral anastomosis has been made below it does not matter if the pylorus will resume its work, because there can be no obstruction of the jejunum while it is attached to the stomach. These principles should be borne in mind, because they amount to something in stomach surgery, and everything else is of very little importance.

Dr. W. L. Rodman, of Philadelphia.

I think that we are indebted to Drs. Mayo and Finney for two very excellent papers. The comfort that I take from Dr. Mayo's paper is that anterior gastro-enterostomy may be done in such a way as to be a very successful operation. I have preferred the posterior route for physiological and anatomical reasons. Dr. Mayo says that he, too, has latterly been doing the posterior operation, yet in a very much larger number of anterior operations he has not had the "vicious circle" or other disagreeable symptoms follow except in a few cases. Such a statement coming from him is reassuring, for while we may prefer the posterior operation there will be times undoubtedly when the anterior route is far more easy and practicable. I personally think that we have, perhaps, feared the vicious circle more than we should have done. It is undoubtedly in a small percentage of cases an actual danger, but Dr. Mayo has told us that it will not occur very often, and his experience entitles him to speak in an *ex cathedra* way. I believe that gastro-enterostomy as an operation has come to stay and do not think that we will ever give it up, as it is more popular to-day than it ever has been. We are indebted to Dr. Mayo for pointing out the proper way to do anterior gastro-enterostomy, which may be done when the posterior route is impracticable. Dr. Kammerer speaks of a method of suturing which to my mind has a distinct advantage over

the purse-string suture. I have used it, and much prefer it to any other method. I do not believe that pyloroplasty is an operation that we can positively say has come to stay, and, as Dr. Finney says, it is being done less now than formerly. A recent careful review of the subject convinced me that few men are as enthusiastic about pyloroplasty as they formerly were. It is both dangerous and uncertain in its results. I should call Dr. Finney's operation gastro-enterostomy rather than pyloroplasty. Pyloro-duodenostomy would be, I should think, a good name for his operation. It is an ideal way of doing gastro-enterostomy, as it makes the anastomosis at the pylorus, where it normally exists. I believe Dr. Finney's operation a good one, and one that will commend itself to the profession. I am inclined, however, to take the position of Dr. Richardson. The mortality from partial gastrectomy is not very much greater than that of either pyloroplasty or gastro-enterostomy, and if you can do it with but little more danger than the others it should be preferred. I believe the trend is toward pylorectomy or partial gastrectomy when practicable. I collected four cases of excisions of benign ulcer two years ago, with a mortality of 15 per cent. Dr. Mayo acknowledges a mortality of 9 per cent. in gastro-enterostomy. If we were to take only partial gastrectomies done recently the mortality would probably not be over 10 per cent.

Dr. Oscar H. Allis, of Philadelphia.

I would like to have Dr. Mayo explain more fully the manner in which he reached the stomach posteriorly, and would also like to have his practical teachings in regard to it. In my dissection I am very fond of removing the entire apron which is not attached to the transverse colon. It is a subsequent attachment, and it is very easy to disconnect it, when you will have no posterior peritoneal cavity. The intestine may be brought up and attached. I would like to know if Dr. Mayo goes through the transverse colon or draws the apron entirely up.

Dr. Joseph Ransohoff, of Cincinnati.

I would like to ask Dr. Finney if his operation is feasible in every case on purely anatomical grounds. He says the opening is two and one-half inches long, but the first portion of the duodenum is not that long in every case. It is movable, but if you think of it being

fixed in this manner in how many cases will not such contraction develop that serious injury would result?

As to the vicious circle, I have not had an opportunity of observing it but once, and in that I made a spur in the small intestine. By doing an inturn of the small intestine before it is applied to the lower border of the stomach you can avoid the vicious circle. It is easy to make this spur, and you can attach the intestines to the stomach afterward.

Dr. Weir. In none of my cases during the last fifteen or twenty times have I taken the trouble to twist the intestine around so that the efferent portion should be toward the pylorus. I think it a waste of time to carry out this old precaution.

Dr. Bevan. As to the continuous suture, it has given the best results that have been obtained by any method of suture, and men who have done the most work in stomach surgery have used this suture. As to the first row of suture getting loose, this is a good fault. It should be an approximation suture, and not a tension suture.

Dr. Mayo. I did the anterior operation always until a year ago, when the posterior was impressed upon my mind by Dr. Robson, and later, when Dr. Weir said the same thing, I tried it, and in some respects think the posterior method the better of the two. The size of the vascular loop which supplies the transverse colon has something to do with the choice. A small loop leaves too little room for work; also, when there is considerable fat in the mesentery it is hard to get at the posterior portion of the gastric wall. In the better class of cases one can do pylorectomy and partial gastrectomy, and it is only in a limited number of cases that one does a gastro-enterostomy for cancerous disease. In my early experience I had two cases of pernicious vomiting. Later, I found that whenever the traction weight of the attached intestine was sufficient to tip the stomach over these cases did not vomit. The posterior operation has shown better results in this respect than the anterior for technical reasons. One naturally places the opening lower in the posterior operation as one gets more space to work on the anterior surface, and, to avoid blood-vessels, places the opening higher. As to Dr. Allis' question in reference to the method of doing the posterior, I pull the stomach out,

grasp the transverse colon and the omentum, and draw both up until the mesocolon comes taut and the jejunum can be seen and grasped at its origin. In the free space between the loop of the bloodvessels in the transverse mesocolon a hole is torn, and through this the jejunum is attached to the posterior wall of the stomach. After pyloroplasty the pylorus becomes adherent and lies higher than it would naturally, because the patients are not fed during the first few days. The stomach may be greatly dilated and the muscular wall feeble and unable to elevate the food to the high lying pylorus even if the plastic operation has succeeded in permanently enlarging the opening.

I think the operation proposed by Dr. Finney is one I should like to think about. The main question as to gastro-enterostomy is whether the pylorus is open or not. If it is open one must do something more than simple gastro-enterostomy to provide for future contraction and spur formation, possibly a primary entero-anastomosis is indicated in these cases. In ordinary cases in which the pylorus is permanently obstructed there is nothing better than gastro-enterostomy, and in our experience entero-anastomosis is unnecessary.

Dr. Finney. As to Dr. Bevan's suggestion of the great difficulty of this operation over Kocher's pylorectomy, I would say I know whereof I speak when I say it is a much simpler operative procedure. It simply has to be tried to prove it. It seems to be mistaken for a complicated operation, but it is not so at all. It is simply the matter of separating adhesions, and is not a difficult operation. As to the particular suture to be employed, it is simply a matter of individual opinion and experience. Dr. Bevan has made a very sweeping statement in this connection, that the interrupted suture has no place in intestinal surgery, and mentioned names to substantiate his remarks; but there are many other surgeons equally eminent who differ from him in this respect.

I cannot subscribe to his statement that the continuous suture has every advantage over the interrupted suture.

As to Dr. Ransohoff's question concerning anatomy and the direction of the duodenum, in my cases it has been perfectly possible to bring the duodenum and stomach over against each other, and there has been no difficulty in so doing. Two complications have developed in my five cases; first, within a month after the operation, one patient developed slight jaundice, which existed for about ten days.

In my last case a transient glycosuria developed, which lasted for three days and then disappeared. This has been observed in other abdominal operations. The matter of the reformation of adhesions is an important one. This is a point which time and enough cases will alone determine. I am prepared to expect that in a certain number of cases this will prove an objection, but this is a much more rational operation, for obvious reasons, than gastro-enterostomy can ever be. If you can re-establish the normal pyloric opening by anastomosis at or near the original one, it is a more rational procedure than gastro-enterostomy, notwithstanding the fact that gastro-enterostomy has given such satisfactory results in the hands of certain operators. As I have said, I have had very little satisfaction with gastro-enterostomy, but of course it may be that I have not done it right.

Dr. Allis. Dr. Mayo did not make quite clear to me his manner of entering the posterior wall of the stomach. The part of the intestines that apparently has its peritoneal covering obliterated is that part which, passing from the stomach, goes around to take this position, and I would like to know whether or not Dr. Mayo goes through the mesentery.

Dr. Mayo, replying to Dr. Allis, stated that he went through the transverse mesocolon.

THE SURGICAL TREATMENT OF TUBERCULOUS PERITONITIS.

By A. J. OCHSNER, M.D.,
CHICAGO.

At the present moment the treatment of tuberculous peritonitis seems to drift back into the hands of the practitioner of internal medicine after having been virtually considered a surgical disease.

Koenig's[1] work had attracted so much attention that surgeons were generally willing to undertake the treatment, and their immediate results were usually so favorable that it seemed as though the surgical treatment had been permanently established. In studying the literature, my assistant, Dr. N. M. Percy, and myself have found that surgeons with a considerable experience report approximately 50 per cent. of recoveries, extending over at least two years. Surgeons who report fewer cases show a larger percentage of recoveries, but it is scarcely fair to count these cases, because it is likely that in this group a greater proportion of favorable than unfavorable cases are reported—*i. e.*, of all surgeons who have operated upon only one or two of these cases those who have been fortunate in their results will feel inclined to encourage others, while those whose results have been unfortunate abandon the subject as unworthy of special attention.

Some authors of great experience have placed the favorable results after surgical operations higher.

Tait[2] placed the mortality at 3 per cent., permanent cures at 30 per cent., those improved but not permanently cured at 50 per cent.; 17 per cent. were either not improved or their condition was made worse by the operation. He stated expressly

that drainage, irrigation, and medication of the abdominal cavity are not only useless, but actually undesirable, and that the simpler the operation performed the better the result. This idea is illustrated in many of the instances in which the cases reported were found to suffer from tuberculous peritonitis when the operation had been performed with the expectation of removing an ovarian cyst, the fluid being drained and the abdominal wound closed. In many of these cases the condition seemed absolutely hopeless, and it seemed foolish to do anything at all. Many of the cases found in the literature are almost perfect duplicates of the celebrated case on which Spencer Wells operated in 1862 with the same unexpected result. A similar case which has been frequently quoted was operated on in 1884 by Z. B. Adams. This case is especially interesting, because the patient was still in good health ten years later.

A very large number of similar cases has been reported by different authors, and the literature contains many interesting compilations of cases—Koenig, Watson Cheyne, Osler, Cellier —which appear to show great benefit from abdominal section. During the past few years it has been shown by Borchgrevink,[3] Teleky,[4] Yeo,[5] Herzfeld,[6] Wunderlich,[7] Byford,[8] and others that the results in cases treated for tuberculous peritonitis in the medical departments of many of the great hospitals were about the same as those in the surgical clinics. If these observations are correct, it seems as though these patients should be placed under medical rather than under surgical treatment, because the latter is, of course, connected with a greater amount of pain, and a slight amount of danger from the operation itself. That many cases have recovered permanently and completely after abdominal section there can be no doubt, because this has been positively proven by autopsy upon patients who died from other causes, when their tubercular lesions were found completely cured, tuberculosis having been demonstrated at the operation and the diagnosis confirmed microscopically—Halsted, Nassoned.

Although the diagnosis cannot be made so positively in the cases which have been treated without operation, it seems clear

that many undoubted cases have been cured by medical and hygienic measures.

An analysis of the various papers on both sides of this controversy shows, it seems to me, that the authors were not discussing the same class of patients.

The medical men seem to deal with these cases earlier in the attack, while the condition is still more or less acute; on the other hand, the surgeons deal with the cases in the chronic condition after the cases which are curable by medical treatment have been eliminated. In other words, the medical treatment is virtually applied to all cases at first, and, if persisted in, will result in approximately 50 per cent. of cures, of which about one-half have a recurrence after a number of years. If the medical treatment in the remaining 50 per cent. of cases is continued after the time when it becomes apparent that it has no beneficial effect, then the chances are that those cases will go from bad to worse until they succumb. If, however, the surgical treatment is employed in these cases in which the medical treatment has proven to be of no benefit, then all of the cases of this group which recover permanently as well as those which are temporarily improved constitute an absolute gain, because they reduce the failures from the internal treatment and increase the favorable results by their entire number.

It is interesting to note that all authors who favor the medical treatment of these cases insist upon beginning during the early part of the attack, in fact, as soon as the diagnosis has been made—Rose,[9] Oehler,[10] and others.

They all advise primarily hygienic measures, rest in bed, intestinal antiseptics, some form of creasote, and some form of iodine to be given internally; also sterilized concentrated food.

Many external applications have been advised, especially ointments containing some form of iodine or mercury. Many of those advising surgical treatment combine hygienic treatment with it, and advise that this be combined indefinitely after the recovery from the operation.

Of those who advise operative treatment several surgeons of large experience—Watson Cheyne,[11] Hildebrandt, and others—

caution against operation too early in the attack, because recurrence is more likely in case the operation is performed before the tubercles are fully developed.

Gatti[12] has demonstrated experimentally that this is a wise precaution to take, because new tubercles developed in the animals after an early laparotomy, while in other similar animals a later operation resulted in a permanent cure. He attributes the cure to the secretion of an alexin which he claims is not produced before the tubercles have been fully developed.

Many experiments have been made to determine the manner in which the cure is accomplished. Hildebrandt[13] demonstrated in animals upon which an artificial tuberculous peritonitis has been produced, that the abdominal section is followed by a severe hyperæmia, which lasts longer than in cases not suffering from tuberculous peritonitis. He considers this a curative element, and attributes it to the action of the air upon the diseased peritoneum, as it does not occur when the animals are kept submerged in normal salt solution during the operation.

Salvolini,[14] acting upon this suggestion, withdrew the ascitic fluid in six cases of tuberculous peritonitis, and then filled the cavity by insufflating air. The treatment resulted in a cure in each case.

Arcangeli[15] attributes the curative effect of abdominal section to an antitoxin produced from the dead bacilli, which will be absorbed. His conclusions are based upon experimental research. He finds that the antitoxic effect of the ascitic fluid increases with its age.

The following table contains all the cases of tuberculous peritonitis upon which I have performed abdominal section at the Augustana Hospital during the past eleven years, with the hope of obtaining a permanent cure. This group contains thirty-two cases, varying in age from nine to fifty-six years:

From the age of 8 to 19 years there were 11 cases.
From the age of 19 to 29 years there were 9 cases.
From the age of 29 to 39 years there were 6 cases.
From the age of 39 to 49 years there were 3 cases.
Above the age of 49 (55, 56, 58 years of age) there were 3 cases.

There were twenty-four female and eight male patients.

But one patient (case 12) died as a direct result of the operation on the seventh day from exhaustion. The appendix in this case was tuberculous, and was deeply embedded between the cæcum, the ileum, and the omentum. Its removal necessitated a very tedious dissection. It seemed to me at that time that it would not be good surgery to leave this infected organ in the abdominal cavity. The patient was fifty-five years of age and her resistance was not good, and she never reacted from the operation. I am now positive that this was bad surgery, because in other similar cases in which I simply removed the fluid and exposed the peritoneum to the air and closed the abdominal wall or drained the cavity for a week longer, the patients have usually done surprisingly well.

In this series there are several such cases; Nos. 2, 8, 10, 15, 16, 18, 19, 23, 27, 30, 31, 32 were in a similar, and, in fact, most of them in a worse, condition. Several of them were so advanced that nothing was done after the abdomen was opened except to empty the fluid, because it seemed absolutely useless, the cases being apparently in a perfectly hopeless condition. Nevertheless they recovered from the operation, and many of them have been perfectly well for many years, as will be seen from the tables.

I was impressed most thoroughly with this fact by two cases, whose histories I will give in abstract to illustrate the extent to which recovery may occur in cases in which the pathological condition at the time of the operation seems to preclude the possibility of a complete recovery. The first of these two cases does not belong to the group in the accompanying table, because she was not operated on in this hospital. I simply quote this case because it shows more perfectly the possibilities in these cases than any of the cases in the present group.

In June, 1891, I operated upon a married woman, twenty-six years of age, whose ovaries, tubes, and uterus were embedded in a thick mass of tuberculous tissue so extensive that it seemed absolutely useless to attempt its removal. The cæcum, omentum, and the small intestines were also matted together, a con-

dition very similar to that found in case 31. The entire parietal and intestinal peritoneum was thickly studded with tubercles. The remaining abdominal space was greatly distended with fluid, and I simply inserted a drainage tube in the hope of giving the patient a slight amount of temporary relief and closed the remaining portion of the abdominal wound. She recovered slowly, but was able to return to her home in six weeks. It is now eleven years since I performed this operation, and the patient is a strong, healthy woman, and has given birth to two healthy children.

When I inquired a short time ago of her family physician for the date of her death after her return to her home from the hospital, I was amazed to learn of her subsequent history. Case 8 of the present group is a similar example. This patient came under my care May 1, 1896, and was operated on the following day. She was then fifteen years of age; was reduced to a skeleton, weighing 62 pounds. The abdomen was distended to the size of a five months' pregnancy; she was compelled to sit with her knees drawn upon her abdomen, so that she rested her hands and her forearms upon them, and on these she rested her chin. This was the only position in which she could be comfortable. I performed an abdominal section, and found four pints of free fluid. The intestines, omentum, ovaries, and tubes were so thoroughly embedded in masses of tuberculous tissue that the case seemed absolutely hopeless. A drainage tube was inserted. The patient began to gain slowly but steadily. She took antituberculous remedies for several years and developed into a beautiful, healthy woman.

In a letter I received a few days ago she states that her health is perfect; that she now weighs 120 pounds, which is more than double her weight at the time of the operation after the ascitic fluid had been removed. Her photograph, which was sent me, shows her to be vigorous and well-nourished, and exceedingly beautiful, and evidently completely recovered from her tuberculous disease.

Of the patients who died a short time after the operation, but not directiy as a result of the operation, it seems important to

observe that in case 14 the condition was complicated with tertiary syphilis, the abdominal ascitis due to the tuberculous peritonitis increased constantly, and the patient's condition became more serious under the antisyphilitic treatment, which had been instituted previous to the operation. It seemed as though the patient could be more readily relieved of the syphilis after being relieved of the ascitis, but the result was quite the reverse. It is possible that the operation hastened her death, although she was rapidly approaching a fatal conclusion when the operation was performed.

Case 21 improved rapidly after the operation, and was able to return to her home after one month, but succumbed to a new invasion three months later. It is not likely that the diffuse miliary tuberculosis of which she died had any relation to her operation.

Case 22 was complicated with the comparatively rare condition of tuberculosis of the pancreas. The patient was more comfortable after the operation, but it is not likely that the operation either lengthened or shortened her life.

In case 27 a latent pulmonary tuberculosis became very active directly after the operation. It is probable that he would have lived a little longer without the operation. It has been observed that patients with a tuberculous family history, suffering from even a slight pulmonary tuberculosis complicating the tuberculous peritonitis, do not recover readily from the latter condition after abdominal section.

In twenty-one out of thirty-two of the patients in this series I have obtained definite information concerning their history after leaving the hospital. Of these cases fifteen are well from one to eleven years after the operation, five have died, two are too recent to be considered except from the standpoint of immediate recovery from the operation. Ten cases I have not been able to trace; they belong to the laboring classes who have no permanent homes.

All of these patients had been under internal treatment for a considerable period of time before the abdominal section was performed without being benefited; several of those who have

apparently made a permanent recovery were in what seemed to be a perfectly hopeless condition when they entered the hospital.

A study of the literature, together with a review of our clinical experience with the cases continued in the accompanying table, seem to warrant the following conclusions. These do not correspond to the conclusions of any of the various authors, but contain the views which I have accepted after considering the ideas of these various authors in connection with my own clinical experiments.

1. Patients suffering from tuberculous peritonitis should first be subject to careful medical treatment.

2. This treatment should consist in the use of intestinal antiseptics and antituberculous remedies and rest in bed. Sterilized food and improved hygienic conditions generally should be employed.

3. So long as the patient's condition improves reasonably this treatment should be continued.

4. In case the patient's condition does not improve, abdominal section is indicated.

5. If the disease is confined to a part which can be safely removed without injuring any portion of the tuberculous peritoneum this should be done, provided the surface can be covered with healthy peritoneum.

6. If the removal of any infected portion necessitates the severing of the tuberculous peritoneum or leaving a portion of the peritoneal surface denuded, the diseased tissue must not be disturbed.

7. In case there is fluid in the peritoneal cavity it is doubtful whether it it best to remove any tuberculous tissue, even though it be circumscribed.

8. Enormous quantities of the tuberculous material can be absorbed from the peritoneal cavity after simple laparotomy.

9. It is best to avoid all manipulation of intra-abdominal organs during the operation in case there is a diffuse tuberculous infection, and to confine the operation to simply opening the peritoneal cavity, permitting the ascitic fluid to drain out,

admitting air to the peritoneal cavity, and closing the abdominal wound.

10. Peritoneal adhesions should never be disturbed in patients suffering from tuberculous peritonitis with ascites, for fear of causing intestinal fistulæ.

11. During the time of recovery from the surgical operation and for a considerable period of time after this the patient should be treated medically.

12. The hygienic conditions of the patient must be permanently improved, and he must not be permitted to expose himself to the conditions which primarily caused the tuberculous infection.

13. Permanency of cure is much more likely in patients who are not predisposed to pulmonary tuberculosis.

14. Chronic cases with fluid, notably if encapsulated, not benefited by medical and hygienic treatment, are especially amenable to surgical treatment.

15. Repeated operations are indicated in cases of reaccumulation of fluid.

Hosp. number.	No.	Name, sex, and age.	Admission.	Discharge.	Diagnosis.	Treatment.	Result.
723	1	H. M., Female, 17	May 22, 1891	June 7, 1891	Ascitic form, peritoneum greatly thickened; small tubercles over entire peritoneum, intestines, omentum, tubes, and uterus.	Laparotomy; tubular drainage ten days, nothing removed; eight quarts of fluid.	Recovered. May 13, 1902, eleven years since operation, has been perfectly well, with exception of a few weeks' illness.
770	2	L. S., Female, 58	Aug. 22, 1891	Sept. 12, 1891	Tuberculous peritonitis; peritoneum covered with small tubercles; ovaries and tubes adherent in pelvis in tuberculous mass.	Considerable quantity of fluid removed, not measured.	Recovered.
866	3	I. C., Female, 18	April 5, 1892	Apr. 28, 1892	Tuberculous peritonitis.	Laparotomy and drainage; drainage remained 1 week; removed 25 pints of fluid.	Recovered.
976	4	H. S., Female, 32	Oct. 10, 1892	Nov. 30, 1892	Tuberculous peritonitis, diffuse, with ascites and caseous masses and enlarged glands.	Laparotomy; removed large tubercular mass surrounding both ovaries and tubes.	Recovered.
978	5	L. B, Female, 39	Oct. 11, 1892	Dec. 8, 1892	Tuberculous peritonitis.	Laparotomy; drainage; drained for one week; removed tuberculous ovaries	Recovered.
2362	6	A. A., Female, 16	Sept. 8, 1895	Oct. 27, 1895	Tuberculous peritonitis; both ovaries and tubes completely covered with tubercles.	Laparotomy, draining cavity; abdominal wound closed; both ovaries and tubes removed.	Recovered. May 17, 1902, six and a half yrs. after operation; is well and has been ever since leaving hospital, but has small fistula.
2426	7	E. L, Female, 23	Oct. 6, 1895	Nov. 22, 1895	Tuberculous peritonitis, diffuse, with ascites, complicated with tuberculous ovarian cyst as large as a fist.	Laparotomy: excision of cyst; drainage continued for two weeks.	Recovered.
2844	8	N. H., Female, 15	May 1, 1896	June 12, 1896	Tuberculous peritonitis; intestines, omentum, all pelvic organs in one continuous mass of adhesions, thickly covered with tubercles; parietal peritoneum greatly thickened and one mass of tubercles; a slight amount, about two quarts, of fluid.	Laparotomy: drainage continued for two weeks.	Recovered. May 14, 1902, six years after operation, is in perfect health, weighs 120 lbs., a gain of 58 lbs.; was almost a skeleton at time of operation, and was perfectly helpless.

3263	9	J. A., Female, 37	Oct. 4, 1896	Oct. 26, 1896	Tuberculous peritonitis.	Laparotomy; drainage.	Recovered. Died two and a half years after operation, from recurrence.
3795	10	C. A., Male, 10	May 10, 1897	June 26, 1897	Tuberculosis of entire peritoneum; appendix and mesenteric glands tuberculous; a small amount ascitic fluid.	Laparotomy; excision of appendix and tubercular mesenteric glands.	Recovered. Died in February, 1898.
3898	11	E. H., Female, 25	June 18, 1897	Aug. 13, 1897	Tuberculous appendicitis and diffuse peritonitis with ascites.	Laparotomy; excision of appendix; drainage for one week.	Recovered. May 16, 1902, five years since operation, is in excellent health, but lives in Alabama in better climate.
5248	12	F. S., Female, 55	Aug. 14, 1898	Aug. 20, 1898	Tuberculous peritonitis and appendicitis with slight amount of ascites.	Laparotomy; excised appendix and drained for one week.	Died, as result of operation, from exhaustion on seventh day.
6474	13	S. P., Male, 21	July 30, 1899	Sept. 15, 1899	Tuberculous peritonitis; large amount of ascites.	Laparotomy and drainage for two weeks.	Recovered. May 17, 1902, nearly three years after operation, patient examined and found perfectly well.
6777	14	J. A., Female, 22	Oct. 9, 1899	Nov. 5, 1899	Tuberculous peritonitis complicated with tertiary syphilis.	Laparotomy and drainage for two weeks.	Died four weeks after operation from exhaustion, the disease progressing.
6963	15	J. R., Male, 9	Dec. 3, 1899	Jan. 7, 1900	Traumatic tuberculous attack very violent, following a fall upon abdomen upon the edge of a curbstone during apparently good health; the entire peritoneum was thickly covered with tubercles, the abdominal cavity contained ten pints of fluid.	Laparotomy and drainage for ten days.	Recovered. Patient is perfectly well and strong, May 15, 1902, two and a half years after operation.
7105	16	L. G., Female, 22	Jan. 14, 1900	Feb. 11, 1900	Diffuse tuberculous peritonitis; contained fifteen pints of fluid; ovaries, tubes, and sigmoid in a mass of tuberculous tissue.	Laparotomy and drainage for one week.	May 15, 1902, two years after operation, perfectly well since returning from hospital
7269	17	W. M., Female, 27	Feb. 22, 1900	Mar. 31, 1900	Tuberculous peritonitis.	Laparotomy.	Recovered.
7399	18	J. H., Female, 27	Mar. 21, 1900	June 11, 1900	Tuberculous peritonitis; intestines and omentum in a mass of tuberculous tissue; mesenteric glands tubercular, pelvic organs adherent in mass of tuberculous tissue, very slight amount of fluid.	Laparotomy and drainage for one week.	Recovered. May 14, 1902, is well and able to do all the housework.

Hosp. number.	No.	Name, sex, and age.	Admission.	Discharge.	Diagnosis.	Treatment.	Result.
7491	19	E. D., Female, 26	Apr. 16, 1900	June 7, 1900	Tuberculous peritonitis; Fallopian tubes and ovaries embedded in mass of tuberculous tissue in pelvis; peritoneum universally thickened and covered with tubercles.	Laparotomy and drainage two weeks; moderate amount of fluid.	Recovered.
7569	20	O. B., Male, 19	Apr. 30, 1900	June 9, 1900	Tuberculous peritonitis; mesenteric glands generally involved; very slight amount of fluid.	Laparotomy; sponged out cavity with hot sponges wrung out of normal salt solution; no drainage.	Recovered.
8000	21	G. S., Female, 10	Aug. 21, 1900	Sept. 21, 1900	Tuberculous peritonitis; diffuse miliary form with great amount of ascitic fluid, not measured.	Laparotomy; removed fluid; wound closed.	Recovered. Died from diffuse miliary tuberculosis Dec. 20, 1900, four months after operation.
8130	22	C. H., Male, 43	Sept. 18, 1900	Oct. 16, 1900	Diffuse tuberculosis of peritoneum; pancreas tuberculous.	Laparotomy; removed fifteen pints of ascitic fluid; no drainage.	Died four weeks after operation, the disease progressing constantly.
8188	23	E.M.F., Female, 30	Sept. 21, 1900	Oct. 31, 1900	Diffuse tuberculous peritonitis, ascitic form; ovaries and tubes in a mass of tuberculous tissue in pelvis.	Laparotomy; removed large quantity of fluid; closed abdominal wound.	Recovered.
8468	24	A. W., Female, 15	Dec. 6, 1900	Jan. 11, 1901	Diffuse tuberculosis of peritoneum, with adhesions; appendix free, but double normal size in a mass of tubercles.	Laparotomy, evacuated small amount of fluid, also tuberculous appendix; no drainage; intestines and omentum adherent, also ovaries, tubes, and uterus; adhesions not disturbed.	Recovered. Had severe attack of pleurisy with effusion four months later, from which she recovered. May 20, 1902, the patient is in excellent health, living in California.
8529	25	H. W., Female, 22	Dec. 27, 1900	Jan. 31, 1900	Tuberculous peritonitis and tuberculous appendicitis; no ascitis; peritoneum studded with tubercles, but not completely covered, not much thickened.	Laparotomy; excision of appendix.	Recovered. May 16, 1902, patient well one and a half years after operation.

8559	26	C. J. B., Female, 34	Jan. 6, 1901	Feb. 17, 1901	Tuberculosis of peritoneum and appendix and Fallopian tubes; no ascites; peritoneum studded with tubercles in all parts, but not much thickened except over Fallopian tubes.	Laparotomy; excision of appendix, both ovaries, and tubes.	May 12, 1902, sixteen months since operation, patient is well and has gained greatly in strength and somewhat in weight.
8963	27	A. S., Male, 16	April 1, 1901	Apr. 17, 1901	Tuberculou speritonitis, fibro-adhesive variety with intestinal obstruction; appendix embedded in thick mass of tuberculous tissue; entire peritoneum greatly thickened.	Laparotomy; nothing removed; wound closed.	Recovered. May 16, 1902, patient is fat and well, about one year after operation.
9390	28	E. T., Male, 56	July 10, 1901	Aug. 5, 1901	Tuberculous peritonitis; abdomen distended with ascitic fluid.	Laparotomy; drainage for one week.	Died five weeks after operation, disease progressing constantly, the pulmonary tuberculosis increasing enormously after the operation.
9789	29	F. J., Male, 43	Oct. 4, 1901	Nov. 17, 1901	Tuberculous peritonitis; intestines and omentum adherent; ascites; twenty pints of fluid removed.	Laparotomy; drainage for two weeks.	Not improved.
10,003	30	Mrs. F., Female, 40	Nov. 25, 1901	Jan. 15, 1902	Tuberculous peritonitis; peritoneum 2 mm. thick; intestines and omentum and parietal peritoneum diffusely adherent; two pints of fluid isolated in pelvis.	Exploratory laparotomy; found it impossible to reach fluid without danger of causing intestinal fistula, hence abdominal wound was closed and pelvis drained through vagina.	Recovered. May 16, 1902, patient very well, able to do hard work five months after operation.
10,224	31	Mrs. H., Female, 33	Jan. 22, 1902	Feb. 20 1902	Tuberculous peritonitis; ovaries and Fallopian tubes surrounded by a mass of tuberculous tissue; cæcum, small intestines, and omentum also adherent in similar mass.	Laparotomy; drainage for ten days; five pints of fluid from space between tuberculous mass in pelvis and in upper portion of abdominal cavity.	Recovered. May 16, 1902, patient is still weak four months after operation.
10,494	32	C. D, Female, 19	Mar. 18, 1902	Apr 15, 1902	Diffuse tuberculous peritonitis; appendix, cæcum, ovaries, and Fallopian tubes covered with thick masses of tuberculous tissue.	Laparotomy; drainage.	Recovered. May 15, 1902, patient well two months after operation.

Bibliography.

1. Koenig, F. Centralblatt für Chirurgie, 1884, No. 6, and 1890, No. 35.
2. Tait, Lawson.
3. Borchgrevink. Klinische u. Exper. Beiträge sur Lehre der Bauchfell-tûberculose. Stuttgart, 1901. (Erwin Naegele.)
4. Teleky. Centralblatt für d. Grenzgeb. d. med. u. Chir., 1899, ii.
5. Yeo. London Lancet, March 16, 1901.
6. Herzfeld. Mittheilungen aus d. Grenzgeb. d. med. u. Chir., 1900, iv.
7. Wunderlich. Arch. für klin. Gyn., lix.
8. Byford. Annals of Surgery, September, 1899.
9. Rose. Review in Centralblatt für klin. Chir., 1901.
10. Oehler. Centralblatt f. d. Gesammte Therapie, 1901.
11. Cheyne, Watson. London Lancet, March 16, 1901.
12. Gatti. Review in Gould's Year-Book.
13. Hildebrandt. Münch. med. Wochenschrift, 1898, Nos. 51, 52.
14. Salvolini. Clinica Med. Ital., 1899.
15. Arcangeli. Il Policlinico, September, 1899.
16. Bottomly. Boston Medical and Surgical Journal, December 13, 1900.
17. Davis, G. W. Lancet, February 2, 1901.
18. Kennedy and Steele. Lancet, August 25, 1900.
19. Grant, W. L. Philadelphia Medical Journal, December 1, 1900.
20. Miller, G. D. Medical Record, July 14, 1900.
21. Le Conte, R. G. Annals of Surgery, February, 1901.
22. Davis, Byron B. Journal of the American Medical Association, August 20, 1898.
23. Lejars. Progrès Méd., December 7, 1898.
24. Richardson. Philadelphia Medical Journal, December 1, 1900.
25. Biagi. Gaz. degli Osped., December 2, 1900.
26. Roper, Arthur C. London Lancet, June 15, 1901.
27. Bell, Blair. London Lancet, March 23, 1901.
28. Osias, M. Philadelphia Medical Journal, December 1, 1900.
29. Nassauer, Max. Münchener med. Wochenschrift, April, 1898.
30. Dieulafoy. London Lancet, December, 1899.
31. Cheyne, Watson. London Lancet, December 23, 1899.
32. Hildebrandt. Jour. d. Clinique e. d. Therapeutique, August 10, 1891.
33. Fenger. Annals of Surgery, 1901.
34. Monti. Wiener klin. Wochenschrift, 1897, No. 42.
35. Ebstein. Thesis, Breslau, 1899.
36. Syms, Parker. Medical Record, April 2, 1898.
37. Nannotti and Baciocchi. Ann. d. Universita Toscano, 1895, xx.
38. Dennis. Philadelphia Medical Journal, September, 1899.
39. Fontaine, Henri. Boston Medical and Surgical Journal, October, 1901.
40. Abbe. Report of the American Surgical Association.

DISCUSSION.

Dr. A. D. Bevan, of Chicago.

We are all very sorry that Dr. Fenger is not here to discuss this paper, and all of the Fellows are familiar with his article on this subject. I agree with Dr. Fenger's conclusions that an exploratory laparotomy in tuberculous peritonitis is of absolutely no value whatever. I think Dr. Fenger's demonstrations prove the correctness of this view. My own experience in a number of cases where I made an exploratory laparotomy the entire peritoneal cavity was obliterated, and it was impossible to accomplish practically anything. I closed the abdominal incision and, strange to say, the patient made a rapid recovery without anything apparently being done. Such an operation could not have anything to do with the recovery of the patient, and this convinced me that Dr. Fenger's statement that an exploratory laparotomy was of no value was correct. The surgeon should hand these cases back to the clinician, with thanks for the opportunity of studying them. I agree with the suggestions of Dr. Ochsner as laid down in the rest of his paper. At the Presbyterian Hospital in Chicago we turn over to the University all our cases of tuberculous peritonitis. I remember two cases, however, in which the X-ray was used with excellent results.

Dr. H. L. Burrell, of Boston.

I did not intend to speak upon this subject, but while Dr. Bevan has been speaking I have been busily thinking over what has been said, and I disagree with both Dr. Ochsner and Dr. Bevan. The difficulty in tuberculous peritonitis is the question of establishing the diagnosis. There are various abdominal conditions which are called tuberculous peritonitis. Take an acute process with a high temperature, a high leucocyte count, and pus in the abdomen, and to me it would be absurd not to evacuate that purulent material. On the other hand, where there is an agglutinating peritonitis, where everything is adherent, you have a very different problem to deal with. The chronic variety of tuberculous peritonitis, where there is a great deal of serous exudate and the peritoneal cavity is studded with tubercles, will, if let alone, take care of itself and will get well under medical treatment. I have been much interested in this subject for a

long time, and since reading Dr. Fenger's article I have started a series of investigations in my hospital service as to what constitutes tuberculous peritonitis, and I trust I may have something to say about it in a few years.

Dr. W. J. Mayo, of Rochester, Minn.

We have had a very considerable number of this class of cases, and I agree with Dr. Burrell. The cases in which there is no fluid are not surgical cases, and it is not advisable to perform an operation in the face of universal adhesions. The principal danger is fistula due to accidental injury to the adherent intestine. The cases in which surgery does most good are those in which there is fluid which is encapsulated. These are purely surgical; you cannot expect such an accumulation of fluid to disappear under medical treatment, and, as a matter of fact, many of these cases are supposed to be cystic tumors at the time of operation. The class in which there is a medical and surgical side are those chronic collections of fluid due to peritoneal tuberculosis in which there is little tendency to formation of adhesions. Why should a patient be put to bed by the physician for weeks to do what the surgeon can do in a short time? In the class of cases where the fluid is free the patient may get well in the course of time under medical or no treatment; but the fluid has existed for a long time, as a rule, when the patient comes to the surgeon. Why is medical treatment for months so much better than surgical? I cannot admit that a cure by so-called medical treatment is any different from a cure by surgical treatment, and if the latter saves time and expense it is the better of the two plans. Acute peritoneal tuberculosis should be treated medically, but after the early stages are over and the fluid does not disappear under medical treatment the surgeon should be called in.

Dr. M. H. Richardson, of Boston.

This subject is a very important one, and one of which the discussion could well occupy a whole day. I have been impressed by the great variety of forms in which tuberculosis of the abdominal organs manifests itself, both in symptoms and in signs. The pathology of the disease is so obscure, its course so variable, that it is often difficult to make the diagnosis and to suggest the treatment. The diagnosis may be reasonably obvious from the history, from the symptoms, and

from the physical signs, and the plan of treatment may therefore be carefully considered beforehand. The diagnosis may, on the other hand, become apparent unexpectedly in the course of an exploratory laparotomy, and the proper treatment may have to be decided upon off-hand.

The results of simple incision in the generalized form of tuberculous peritonitis have been, in my experience, so encouraging that I have applied this simple remedy with considerable confidence. Even in a tuberculous ascites, with considerable masses scattered here and there among universally disseminated miliary nodules, I have been not without hope of permanent cure after evacuation of the fluids.

If simple incision through the abdominal walls has any real curative influence, a localized peritoneal tuberculosis ought to do better under this treatment than a generalized one—a miliary tuberculosis of the ileo-cæcal coil ought to disappear even more surely and more quickly than a miliary tuberculosis of the whole peritoneum. When, therefore, I have found a tuberculosis limited to a single coil of intestine, rather than excise that coil, except when stricture is present, I have contented myself with the exploration and demonstration of the disease. If the area affected has been one that could be easily and safely removed I have removed it, as in tuberculosis limited to the appendix or to the Fallopian tubes. In other words, I have made sure of thorough removal when that operation was safe; when dangerous, I have relied upon the supposed beneficial effects of the exploration *per se*. Removal of localized tuberculosis has been followed by the most brilliant results in tuberculous strictures of intestine, in localized tuberculosis of the ileo-cæcal valve with fecal fistula, and in tuberculous glands of the ileo-cæcal coil. On the other hand, simple exposure of an infected coil has thus far been encouraging.

It has always seemed to me extraordinary that the simple operation of emptying an abdomen filled with the fluid of a general miliary tuberculous peritonitis should cure; but the results have been, in my experience, astonishing. I cannot believe that medical and palliative treatment would do as well. Even after a careful study of the lamented Fenger's article, I am by no means convinced that our efforts in the line of surgical treatment should be relaxed.

Dr. R. F. Weir, of New York City.

I agree as to the uselessness of attacking these tuberculous difficulties when the intestines are all matted together. As to the influence of

laparotomy upon tuberculous conditions of the bowels I have had one illustrative case. In this case it became necessary to make an artificial anus, and upon operating I found miliary deposits everywhere. Four months afterward resection of the intestine was done, when every tubercle had disappeared. It made the most striking impression upon me, as this good result seemed to be due to the first operation.

Dr. Oscar H. Allis, of Philadelphia.

The success which has followed these cases of tuberculosis upon which I have operated has been very great. Only six weeks ago I operated upon a young lady in college. I was telephoned for in the evening and told that the case was one of appendicitis. I sent her to the hospital at once and operated the next morning. The abdomen was filled with tuberculous material. The diagnosis was made because the pain was in the region of the appendix. She recovered promptly.

Dr. W. B. Coley, of New York City.

My experience with these cases has not been very large, yet I have had four cases of tuberculous peritonitis of the hernial sac. In one of these, who had been previously operated upon for tuberculous appendicitis, I found a tuberculous peritonitis of the miliary type in the sac wall of the ventral hernia, and in spite of the two laparotomies the patient died of the general disease a year later.

One of my cases had fluid in the abdomen. I have read Dr. Fenger's article very carefully, and also most of the recent literature on the subject. I must say that a careful study of these cases does not enable me to agree with the pessimistic conclusions of Dr. Fenger. I was very much at sea when reading the statistics, as they were very contradictory. I think Dr. Ochsner is right in sending these cases in the early stages to the medical men rather than the surgeons, although I believe that there is no reason why medical treatment lasting six months should be employed if an operation will bring the same results much more promptly. There is a class of cases for the physician and another for the surgeon.

Dr. Ochsner. I believe that all the speakers except Dr. Bevan have agreed with me perfectly. Dr. Burrell's case is one in which the cure had already begun, and it is one of the cases covered by my conclusions. All such cases should be first treated medically. I have

had two cases treated by the X-ray, and those cases have been shown by experimental work to be cases in which, if left alone, the tuberculosis would be destroyed spontaneously. It is in the class of cases in which a spontaneous cure would not occur that the abdominal section is especially indicated; those which have been treated by rest in bed, by hygienic measures, by iodine internally, by aseptic food, that are not benefited, in which there will presently be a mass of tuberculous material above and below with a lot of fluid between, in which a very simple operation will result in a cure in 50 per cent. of the cases. Dr. Fenger said 50 per cent. will recover without operation, but I should say 50 per cent. of those who are not benefited by internal treatment will still recover if treated by operation. The harm that would come from Dr. Fenger's paper is in depriving those patients that are not benefited by internal treatment from having surgical treatment. As to doing harm by separating adhesions in these cases, my paper states that this is bad practice. I have seen much harm come from doing this—in fact, one of my deaths can be attributed to this error. Dr. Allen's case is very interesting and corresponds to one of mine, an acute tuberculous peritonitis following a rupture of a tuberculous appendix. These cases constantly get worse. Dr. Bullitt read a paper on this subject some time ago. If you treat these cases as Dr. Allen did they will recover rapidly. I believe that by following the conclusions I have formulated we will progress in the right direction.

ON A CASE OF SPLENECTOMY FOR LEUKÆMIC ENLARGEMENT.

By THEODORE A. McGRAW, M.D.,
DETROIT.

Encouraged by Dr. Richardson's case of a leukæmic spleen, I ventured last summer to operate on a similar case in the person of a child, eight years of age. I was not fortunate in the result, but the case, nevertheless, presents some interesting features which make its publication seem desirable.

John I., aged eight years, was brought to me by his father on June 3, 1901. I could not get a very satisfactory history of his case, but as far as obtained it was as follows: He had begun to show symptoms of ill health nearly two years before I saw him. He had suffered but little pain, but had had frequent attacks of chills and fever, for which he had taken large doses of quinine. He still had these paroxysms at intervals of about two weeks' duration. Twenty months ago it was noticed that his abdomen was large and swollen. This swelling had since then constantly increased, until now it was the most marked feature of his anatomy.

Although he was pale and debilitated, his mucous membranes, nevertheless, retained their pink hue and showed none of that pallor characteristic of some kinds of leukæmia. His appetite had during the whole period been good, but the distress from tension after eating prevented him from fully gratifying it. His bowels were regular and his evacuations normal in consistency and color. He had had many attacks of nose-bleed, but not of any intractable character. His breath was short and respirations quick, but he was able to be around on his feet.

On examination I found the child in the highest degree emaciated. His lungs, except for the compression to which they were subjected, exhibited no abnormal symptoms. There was an anæmic cardiac

murmur, and his pulse was over 100 in the minute and rather feeble, but not intermittent. His temperature was 100° F. His urine had a specific gravity of 1020, and contained neither sugar, albumin, casts, nor crystals. His tongue and throat were normal in appearance and of a pink hue. There were no marked lymphatic enlargements in the neck, axilla, or groins, although a few small glands could be felt just above the clavicle. His feet were somewhat swollen and œdematous. The most marked objective feature was the abdominal distention. Excepting in the right and left lumbar regions it was impossible anywhere in the abdomen to discover any intestines. An enormous liver crowded them down from above, and an equally large spleen, extending from the left kidney into the right iliac fossa, forced them into the pelvis. The spleen lying diagonally across the abdomen exhibited the usual notched edges. The kidneys could not be detected. Notwithstanding the great size of the spleen, I was able to detect a certain mobility as I pressed it up and down or from one to the other side, and was encouraged to believe that it was comparatively free from adhesions.

Dr. Ives made a careful examination of the blood, and reported as follows: "Hæmoglobin, 46 per cent.; erythrocytes, 2,070,000; leucocytes, 336,000. The erythrocytes showed a marked poikilocytosis and hæmoglobinæmia degeneration. There were among them some that were enucleated. In the normal-sized monolocular leucocytes the body of the cell was slightly stained with eosin. There were also many giant-celled leucocytes, whose large single nucleus did not stain deeply with hæmatoxylin, the body of these not taking the eosin stain at all. The bodies of the polynuclear leucocytes took the eosin stain slightly."

There could be no doubt of the diagnosis. The only question for consideration was that of treatment. That which decided me to operate was the fact that the distress which he suffered seemed due chiefly to the abdominal distention. If that could be relieved the child might live the remainder of his life in tolerable comfort.

He entered St. Mary's Hospital on June 4, 1901, at 9 A.M; temperature was 99°, his pulse 124; at 4 30 P.M. his temperature was 100.6°, pulse 104; at 7 P.M. temperature 100.8°, pulse 100.

June 5th, 7 A.M. Temperature, 98°; pulse, 120. 4 P.M., temperature, 101.4°; pulse, 120. Thursday, 7 A.M., temperature, 98 04°; pulse, 116. 4 P.M., temperature, 100°; pulse, 132. Friday, 7 A.M., temperature, 99.2°; pulse, 112. At 10 A.M. on Friday the operation

was performed. During the three days of his hospital life prior to the operation he was put on strychnine and quinine, and was given nourishing food and nutrient enemata. As soon as he was under the anæsthetic one and a half pints of normal saline solution was injected under the integument of both axillæ, and after the operation was completed an additional half-pint was thrown into the groins.

An incision eight inches in length was made a little to the left of the median line, through the thin abdominal walls, whose thickness was hardly that of a thick sheet of blotting paper. There was almost no oozing from the incision. The spleen was found to be absolutely free from adhesions, and was easily lifted out of the abdomen. Its veins and arteries were tied separately and cut between two ligatures, and the whole operation was completed without the loss of an ounce of blood. I found, on hasty examination, the liver enormously enlarged. There was a cluster of enlarged lymphatic glands in the pedicle. The left kidney seemed to be of normal size. The right kidney was not examined. There was no gross evidence of pancreatic change. The pulse and respiration of the child at the close of the operation were as favorable as at the beginning, and I was very hopeful of the result. Immediately on severing the pedicle the spleen was taken by my assistant and portions of it inoculated, while warm and living, into the abdomens of three guinea-pigs.

At noon when I called, the boy was sleeping quietly and breathing easily. His pulse was 130. At 1.30 P.M., temperature, 99.6°; pulse, 136. At 4 P.M., temperature, 103.4°; pulse, 128.

He was evidently failing, notwithstanding the saline injections and hypodermics of strychnine and digitalin. At 5.30 P.M. he died. Examination showed the dressings slightly stained with blood, but no evidence of serious hemorrhage. A post-mortem could not be obtained.

The inoculation of the spleen's blood and substance into the guinea-pigs was made to test Löwit's theory as to the rôle played by contagion in producing leukæmia. From among the animals kindly placed by Parke, Davis & Co. at my disposal, three were chosen that were, to all appearances, in perfect health. They were carefully washed and made aseptic, and their abdomens were shaved. Within three minutes after the spleen had been severed from the body my assistants had inoculated the animals, one by injection of the warm blood into

the peritoneal cavity, and the others by inserting slices of the cut spleen. The animals were kept many months under observation. They showed no reaction whatever to the operations. The wounds all healed by first intention. At the end of two months one of the guinea-pigs began to show signs of an enlargement of the neck, which did not, however, seem to impair his general health and vigor. At the end of the fourth month he was killed and examined. His blood, compared with that of healthy animals of his own race, showed no variation from the normal. The enlargement in the neck was a cheesy cyst, very common in these animals. The liver, spleen, pancreas, and kidneys were normal. It was not until nine months after the inoculation that the other two were killed. They were found to be in every respect perfectly healthy.

These experiments had only negative results, and have no other significance than is thus expressed. They were made with the utmost care to secure the most favorable conditions for the growth and development of infectious germs, if such existed. The asepsis was perfect, and the inoculated material living when it was inserted. If Löwit's protozoa exist in the leukæmic spleen, guinea-pigs must possess an immunity to infection by them. It might have been well to vary the experiment by inoculating animals of various species, and also by inserting the morbid tissue into the bone marrow, or even injecting the blood into the spleen itself.

The pathology of leukæmia in its various forms is as yet so obscure that a rational therapeutics is out of the question. Whatever we do for its cure must be done empirically. We do not know whether the lymphatic or lieno-medullary forms are variations of one morbid process or are distinct diseases, nor whether the trouble begins in the bone marrow, or spleen, or liver, or blood. While the preponderance of evidence is in favor of the bone marrow as the original pathological focus, this is by no means so positively established as to be beyond question. None of the operative measures hitherto adopted can be said to decide the question as to the effect which the elimination of the spleen would have on the progress of the

disease, for the reason that there has not, to my knowledge, been any removal of that organ in the early stages of the disorder.

While I have not been able to obtain histories of all cases of splenectomy for leukæmia, yet I have little doubt that nearly if not quite all have been undertaken after the spleen had reached a large size and had become a distressing complication of an advanced disease. Thus in v. Burckhard's three cases the weights of the extirpated organs were respectively 5 kilos, 2 kilos, and 3 kilos. In Richardson's case the spleen weighed about 2¼ kilos, in mine 2½ kilos. That, under these circumstances, with advanced degenerative changes in the blood, liver, spleen, and other tissues, the mortality of the operation should be appalling is not surprising. Nor should we expect that, even though the spleen were the original seat of morbid action, its excision would alter the result, if postponed, until these changes had taken place. It seems to me, therefore, that if we would come to positive conclusions as to the rôle played by this organ in the etiology of leukæmia our next step must be to eliminate it from the field early in the disease. If it could be excised while the patient is still in comparatively good strength, and when it first shows evidence of enlargement, we might draw rational conclusions as to its influence upon the course of the disorder.

Excision of the spleen in leukæmia has hitherto been done for the relief of the abdominal distention with its consequent distressing symptoms. It might possibly, with greater experience, be done early in the disorder as a curative measure. At any rate, we cannot feel safe in making statements as to the relations of the spleen to the other organs affected by the disease until we shall have pursued the course suggested above and carefully watched its effects. We should then be able to determine positively whether splenectomy in leukæmia works to the good of the organism or to the detriment. If to the latter, then the operation should be prohibited; if to the former, then our efforts should be directed to lessening its now excessive dangers. If the elimination of the spleen from the problem

should prove that the presence of that organ had no influence whatever upon the course of the disease, we might still be justified in removing it early in order to prevent the disturbance due to its size and pressure, if only the operation could be made reasonably safe.

A problem which ought to be studied in these cases is the tendency of the enlarged spleen to become adherent to the surrounding structures. The most frequent cause of death after splenectomy for leukæmia has been the hemorrhage due to ruptured adhesions. We may hardly assume that the great size of the organ is alone responsible for this tendency to agglutination, the more especially as in some cases like my own, in which the greatly hypertrophied organ had become crowded in the organ to an extreme degree, adhesions have not been formed. Neither, in the absence of all history of injury, may we ascribe this tendency to hurts. The fever which accompanies the degenerative change may possibly predispose to irritative processes on the splenic surface. Whatever the cause may be, there can be no doubt of the fact that adhesions between the organ and the diaphragm, liver, and abdominal wall in leukæmia are the most serious obstacles to successful surgery. For this reason operations, if undertaken at all, should be done at the very earliest possible period, when the enlargement of the spleen has just begun to make itself manifest. At this period it is not probable that any strong adhesions would have formed; the patient would be otherwise in much better condition, and the necessity of large incisions would not exist. Instead of a very severe operation on a much reduced patient, there would be a comparatively slight operation on a person who had not yet lost his powers of resistance. The history of all other great intra-abdominal operations teaches us that, other things being equal, the danger is in exact ratio to the previous duration of the disease. There is every reason to believe that this history would be repeated in operations on the leukæmic spleen if it should become the rule to operate at the earliest possible period. A series of successful operations at this period could not fail to throw great light on the pathology of leukæmia. It might,

indeed, very materially change our ideas as to the relative influence in the etiology of the disorder of the spleen and bone marrow. I cannot but feel that we shall not have done our full duty in the study of this disease until we shall have altered our practice in respect to the time of operating. In a disease almost uniformly fatal we are certainly justified in pursuing any course which may offer a hope of therapeutic success. The value of operative procedures in an early stage of the disorder has never been put to the test.

In my own operation I was agreeably surprised by the almost total absence of hemorrhage. It is highly probable that in very early operations, skilfully done, this source of danger would be almost entirely eliminated. The weight of a normal spleen in an adult varies from five to twelve ounces. If we operated when it had no more than doubled its normal size, we could remove it through a short incision in a few minutes' time. There would follow no such shock as comes from the sudden relief of great tension and pressure, and we may believe that recovery would be rapid and sure.

To be able to operate early we must, however, get our cases early, and to that end we have to appeal to the general practitioner who alone sees these patients in the beginning of their disease. As the diagnosis depends, then, on the examination of the blood, we should preach everywhere the necessity of such examinations as routine procedure in all cases of wasting disease. The progress of medicine depends no little on the competency of the great mass of the profession, and the study of the early stages of all diseases must always be the great privilege, as well as duty, of the practising physician, who alone has the opportunity to treat them in their beginnings.

DISCUSSION.

Dr. Willy Meyer, of New York City.

In view of the fact that leukæmia has such a bad prognosis and that medical men can do so little for these cases, it seems timely that the question should be brought before an association of surgeons. In 1894 I removed a large leucocythemic spleen in a young man, which had far-reaching, very firm, adhesions between its surface and the diaphragm. The operation itself was not very difficult, except for separating these adhesions. I put in a Micelwitz tampon, but lost the patient during the night, apparently from internal hemorrhage. It was impossible at the time of the operation to ligate all the bleeding points, and I am sure hemorrhage was the cause of death, as there was no shock during the operation. To-day I would treat such a bleeding surface with steam. I also think it is of great importance that, if we are to take up such a question, we should operate early. To judge by the writings of others, so far the opinions are against operation.

Dr. M. H. Richardson, of Boston.

My case of splenectomy for myelogenous splenic leukæmia, reported by Warren, has done well. At last accounts the patient was in perfect health, though I have not been able myself to examine her, or to obtain a specimen of the blood. Indeed, there has always been difficulty in obtaining blood, owing partly to prejudice and partly to ignorance.

This patient presented, at the time that I was called to see her, a large, movable tumor, supposed to be ovarian. Under ether it was positively recognized as an enlarged spleen. Symptoms referable to this tumor, the patient's desire to be rid of it, the improbability of ever getting her again to submit to operation, and, finally, the evident feasibility of extirpation—all these things combined to hasten me into what I now regard as an ill-considered, if brilliantly successful, operation.

The patient's general condition was excellent. I did not for a moment suspect the true cause. I have had under observation a considerable number of cases of this sort, in all of which the question of splenectomy has arisen. In none had I ever considered seriously splenectomy, partly because of the forbidding mortality in the re-

corded cases, partly because of the technical difficulties conspicuous in each case, and partly because of the patient's poor general condition. In the present case the general, local, and the technical conditions were especially favorable.

Several questions seem interesting with reference to this disease :

First, whether the improvement in this case was or was not owing to the splenectomy. If it was owing to the operation, then the operation should be encouraged.

Secondly, whether the bad results of operations thus far performed are owing to the lateness with which they were performed. If they are owing to delay, then the operative treatment should be encouraged and the operation performed at the earliest possible moment.

Thirdly, whether the improvement after operation is not really one of those temporary improvements seen during the natural course of the disease, and under medical treatment. If this is so, operative treatment is of no real utility.

Fourthly, whether in so discouraging an operation as splenectomy, even if justifiable, the sum total in the relief of suffering and in the prolongation of life is increased ; whether, on the contrary, both prolongation of life and relief of suffering are not in reality reduced to a minimum.

Finally, whether a successful case like mine does not, on the whole, by encouraging others to repeat the operation, do more harm than good.

A CASE OF ACUTE SUPPURATIVE PANCREATITIS.

By FRANCIS W. MURRAY, M.D.,
NEW YORK CITY.

From the interest and increasing attention devoted during the past few years to the subject of pancreatitis many practical and important facts have been added to our knowledge of the disease, particularly as regards its etiology and pathology.

The principal and direct cause of the infection is the entry of bacteria in the gland, and the usual route is from the duodenum by the way of the pancreatic duct. It is an ascending infection due, secondarily, to lesions in the duodenum, and the acuteness of the resulting inflammation depends rather on the degree of infection and not on the nature of the exciting agent. Thus, the most acute infection when established is followed by the acute hemorrhagic form, the less acute provokes suppuration or gangrene, while the still less active agent causes sclerosis of the pancreas. Clinically, the most rapid and fatal form is the acute hemorrhagic; the gangrenous and suppurative forms are less so, while the least dangerous is the chronic interstitial form. Hemorrhage, suppuration, necrosis, and sclerosis are closely related to each other, are due to a common cause, and mostly represent a varying degree of infection.

A mild catarrhal inflammation of the duct may exist to start with, and continue for some time; later on, owing to some determining cause, as gallstone, pancreatic calculus, abuse of alcohol, etc., the inflammation assumes an acute form, and hemorrhage, suppuration, or gangrene of the gland suddenly follows.

The treatment is that of a septic infection. Its indications are strictly surgical, and by surgery alone may we hope for

success in these otherwise hopeless cases. In the acute cases incision, removal of the septic foci, and packing, together with free drainage, is called for; in subacute cases incision and drainage of the abscess is indicated; and, in the chronic form—which has been shown to be frequently associated with gall-stone—through cholecystotomy the pancreatic ducts are indirectly drained, and the inflammation subsides.

In meeting these indications we are as yet handicapped by our exceedingly limited ability of diagnosis, and we still await the discovery of symptoms characteristic of the disease. As acute pancreatitis is more frequent than formerly supposed, and as in acute cases a fairly definite clinical picture has been depicted, these facts should lead us to recognize the disease more frequently.

The possibility of making a correct diagnosis has been demonstrated in some instances, and it is the object of this brief paper to record a case in which the diagnosis was made before operation, and the treatment was followed by success.

O. F., aged forty-one years; salesman. Admitted May 8, 1901, to the New York Hospital.

Family history unimportant.

Personal history. Has been a steady consumer of alcohol for twenty years, and for the past seven years has been a heavy drinker. About every six months has been accustomed to going on "sprees," lasting anywhere from three to six weeks, and with the exception of these periods has always enjoyed excellent health. Five years ago, after a spree, he had an attack of severe epigastric pain accompanied with bilious vomiting, the attack lasting three days, and was relieved by medication. Three years ago, after a debauch, he had a similar attack, which yielded to medical treatment. Last January, after a spree lasting two weeks, he was again seized with sudden epigastric pain accompanied with bilious vomiting, the attack lasting this time about a week; but he was unable to return to work for about three weeks. In this attack the pain was more severe, and radiated to the left side and under the left shoulder. About the middle of April another debauch followed, lasting about two weeks, and eight days previous to admission he was suddenly seized with epigastric pain and vomiting. The vomiting was frequent, of a bilious character,

and was increased by the ingestion of food or drink, and after a week's duration it subsided. The pain was, however, more severe than in the previous attacks, and was limited to the epigastric region, radiating at times laterally, but it steadily increased, and finally extended over the entire abdomen. Two days before admission he noticed that the belly was swollen below the ribs, and that his clothes were too small for him. No history of chills or fever; bowels constipated.

Owing to the failure of the treatment, which had been successful in the previous attacks, he applied for admission to the hospital.

Admission. Patient a man of medium height and very fat, with a decided septic appearance. Tongue coated with dark brownish fur; no jaundice. Heart and lungs negative. Abdomen distended, with marked prominence in the left epigastric region. General abdominal tenderness on palpitation, most marked in left epigastrium where belly wall is somewhat rigid. In this region is a mass about the size of a cocoanut, sharply defined, tense and tender on pressure. It is situated chiefly above and to the left of the umbilicus, and extends a short distance to the right of the median line. It is dull on percussion; above and over the region of the stomach, light percussion gives a tympanic note; below the mass, percussion is tympanitic also. The tumor apparently lies between the stomach and transverse colon. Deep percussion over the stomach is dull; the dulness extends into the left hypogastrium and downward, is continuous with that over the tumor. Owing to the fat belly wall no tumor could be felt behind the stomach, but there was a well-marked sense of resistance. Liver dulness small; free edge not to be felt. Skin over back and on the side of the abdomen red and blistered in spots from mustard paste applied before admission. Temperature, 101.8°; pulse, 100 and weak; respiration, 36; urine, clear, acid, 1031; no sugar or albumin; leucocytosis, 40,000.

Diagnosis. Acute suppurative pancreatitis.

Patient refuses operation.

May 13th. Patient has grown steadily worse, very septic, abdominal pain has increased, is constant, and at times there are very sharp paroxysms. Abdomen is about the same; bowels have been moved daily since admission. Temperature, 102.4; pulse, 136; leucocytosis, 36,000.

Operation. 11 P.M. Ether narcosis; thirty ounces of decinormal salt solution injected in vein of right arm. Ethyl chloride spray over

site of tumor, and peritoneal cavity opened by a 5-inch incision through left rectus muscle, and about twenty ounces of a brownish seropurulent fluid gushed out. It came from a cavity bounded behind by the lower edge of the stomach and gastrocolic omentum and upper border of transverse colon, the cavity being shut off laterally by adhesions from the general peritoneum. After mopping out the cavity, fat necrosis was observed in the gastrocolic omentum, the nodules varying from a pin-head to a pea in size. Behind could be felt a large mass posterior to the stomach and extending to the left, and by blunt dissection an opening was made into the bursa omentalis. This was followed by the discharge of over a quart of reddish-brown thin pus containing a considerable amount of white flakes and bits of necrotic fat. Opening enlarged sufficiently to admit two fingers, and the swollen pancreas could be distinctly felt lying to the back of a large cavity. A Ferguson speculum was then introduced through the opening, and with the aid of an electric hand-light a circumscribed view of the pancreas was obtained. It was swollen, dark red in color, and here and there between the inflamed lobules could be seen areas of a yellowish-white color. The abscess cavity was irrigated thoroughly and gently with salt solution, a rubber drainage-tube three-fourths of an inch in diameter and covered with iodoform gauze introduced into the cavity; the smaller cavity packed with sterilized gauze, large dressing of sterilized gauze, and binder over all.

Patient decidedly weaker at the end of operation. Pulse, 160. Ordered strychnine, one-thirtieth of a grain hypodermically, and a stimulating enema of hot salt solution, and extract of coffee.

May 14th. Patient somewhat improved. Abdominal pain decidedly less, pulse still rapid and weak. There is a profuse discharge of thin brownish material from abdominal wound, necessitating frequent dressing. Tympanites increased. During the next two weeks there was a gradual general improvement. Pulse was less rapid and stronger, the temperature lower, and the tympanites gradually subsiding. The discharge from the wound, however, was very profuse, and for the space of four inches around the wound the skin became excoriated and inflamed in spite of the constant use of boric-acid ointment. The edges of the wound, and especially the subcutaneous fat, became necrotic, and was of a greenish-black color.

On *May 16th*, drainage-tube removed, but was replaced on the 20th by a smaller one. The cavity was irrigated several times daily

with salt solution, and considerable necrotic fats and blood clots were washed out.

26*th*. Tube removed and drains of sterilized gauze substituted.

June 1*st*. Discharge contains large amount of fecal matter.

8*th*. General condition of patient not so good; is weaker; is delirious at nights; refuses to take food, and vomits several times daily moderate amount of greenish fluid. Stomach washed out every three hours, and through tube are introduced whiskey, one-half ounce; two raw eggs beaten up in eight ounces of peptonized milk. Nutrient enemata, t. i. d. This method of nourishment was resorted to until June 24th, when the patient began to take food voluntarily. The wound is slowly healing, the discharge is less and is principally fecal matter; very little pus.

July 1*st*. Sits up in bed an hour daily. Wound three by one and one-half inches; at bottom can be seen a small opening which discharges fecal matter.

14*th*. Out of bed. Fistula much smaller, discharge less. From this time the patient's history is that of steady convalescence and with slow decrease in the size of the fistula, and on September 10th he was discharged, with wound completely healed.

May 15, 1902. Patient is well and strong, and has gained sixty-five pounds since discharge from the hospital. Has a good appetite; bowels regular, stools of normal color. Two inches to the left and above the umbilicus is a scar five inches long and two inches wide; scar is firm, no protrusion on coughing. Patient wears abdominal belt.

It may be of interest to add some notes made by Dr. A. S. Chittenden (house surgeon) of experiments made on the secretions of the wound, taken a few days after operation.

Notes of Experiments on Secretions of Pancreatic Fistula.
(*Flannigan.*)

Sugar (*Amylolytic*). About three ounces of purulent secretion from epigastric fistula collected and filtered.

The resulting cloudy fluid was alkaline in reaction to litmus.

A sufficient quantity of dilute solution of boiled starch was prepared which gave the characteristic blue reaction when treated with solution of iodine.

In four test-tubes was placed an equal quantity of the dilute starch solution (temperature 40° C.), and each was then treated successively and about one minute apart with five minims of the filtered secretion from the fistula.

The tubes were again treated in series and about one minute apart with a solution of iodine.

Tube I. gave the reaction (blue) for iodine (slightly impaired).

Tube II. gave a purple color (erythrodextrin).

Tube III. gave a cherry red color (erythrodextrin).

Tube IV. was colorless.

Upon boiling a portion of the contents of tube No. IV. with Fehling's solution, the red oxide of copper appeared.

Fats (*Adipolytic*). Olive oil was shaken with ether and caustic soda, and the supernatant neutral ethereal solution of fat separated off. Evaporation left a fat neutral in reaction to litmus. To this was added a small amount of litmus, and five minims of the prepared secretion from the fistula. The whole was kept warm (40° C.) for two hours, when the blue color of the litmus had gradually given place to red, showing the decomposition of neutral fat into glycerin and fatty acid.

Proteids (*Proteolytic*). The white of an egg was chopped fine and mashed in running water. A sufficient quantity of this was placed in a test-tube covered with twenty cubic centimetres of water to which five minims of chloroform had been added.

To this was added five cubic centimetres of the prepared secretion from the fistula. The test tube was then kept in a thermostat of constant temperature of 38° C. for thirty-six hours. At the end of that time complete solution of the coagulated albumin had resulted. This milky solution upon dilution gave the biuret reaction. No tests for leucin or tyrosin were made.

The pathologist of the hospital, Dr. Biggs, also reported that the fluid removed at the operation responded to all tests for pancreatic juice.

Examination of two good-sized masses of tissue found in fluid evacuated at operation showed necrotic pancreatic tissue. Cultures of this material revealed the abundant presence of the staphylococcus albus.

Remarks. This was a case of acute pancreatitis with suppuration, and its rapid progress is unusual, for, as a rule, this

variety is subacute and runs a slow course, even when the onset is sudden. In this case the infection of the pancreas started from the duodenum, where, owing to the continued and at times the increased use of alcohol, gastroduodenitis existed.

The infection dates back probably to the time of the first attack of pain and vomiting, and it assumed the form of a simple catarrh of the ducts which was aggravated and increased by the frequent sprees, and finally resulted in a suppurative form of catarrh. From the continual ingestion of alcohol and the repeated sprees, the pancreas was in a state of congestion, with increased secretion. Owing to the diminution of the calibre of the pancreatic ducts there was a certain degree of retention of the pancreatic secretions and an increase of tension in the excretory ducts and alveoli. As a result, changes in the epithelial lining of the excretory ducts and alveoli took place, the epithelium of the ducts being destroyed in spots, and the cells lining the alveoli undergoing a fatty degeneration. The bacteria present in the ducts were increased in number and degree of virulency, and, gaining access to the alveoli, suppuration of the degenerated epithelia followed, thus causing a true pancreatic abscess; or the bacteria penetrated the wall of the duct where the epithelial coat was destroyed, and, gaining access to the periglandular tissue, produced a suppurative peripancreatitis. The abscess thus formed steadily increased in size, burrowed forward in the gland and perforated into the bursa omentalis, which then became a large abscess cavity. The infection evidently spread from here forward through the gastrocolic omentum, and produced a localized suppurative peritonitis which was represented by the first abscess opened at the time of operation.

This existence of an intraperitoneal abscess secondary to and with no direct communication with the abscess of the bursa omentalis is interesting and very unusual.

In arriving at the diagnosis in this case, I was assisted partly by the length of time—thirteen days—which had elapsed since the beginning of the last attack, and in a greater degree by the presence of the tumor in the left epigastrium. Had I seen the

the patient at the beginning of the attack a diagnosis would have been impossible, as the symptoms were those which accompany other diseases of the upper alimentary tract. As the bowels had been moved daily since admission, intestinal obstruction was excluded. The history of the previous attacks, with no vomiting of blood or bloody stools, together with the fact that almost fourteen days had passed since the beginning of the last one, ruled out, in my mind, perforative inflammation of the stomach or duodenum, which, as a rule, are fatal in a few days. Gallstone was excluded by the absence of jaundice and the pain being most intense over the left epigastrium. The most characteristic symptom was the presence of the tumor, which was apparently situated between the stomach and transverse colon, the usual location where pancreatic cysts present, and its dulness was continuous with the dulness developed on deep percussion over the stomach, and extending into the left epigastrium. The presence of fever and rapid pulse and the very high leucocytosis suggested suppuration. Finally, the occurrence of the attack, following directly upon a spree, was of some importance to me, as in a case of suppurative pancreatitis seen some years ago, where the diagnosis was not made until after operation, the attack followed immediately after a debauch.

From the history of the attacks always following a spree; from the ability to exclude other affections whose symptoms in the beginning are the same in acute pancreatitis; and, finally, from the presence of the tumor over the site of the pancreas, made it possible to arrive at a diagnosis.

After the patient was anæsthetized, on palpation over the stomach a mass could be felt extending into the left hypogastrium, and it was considered to be connected with the tumor, which lay between the stomach and transverse colon. Owing to the prominence of the tumor in the left epigastrium an anterior incision was employed, and it was evidently the better route of approach, as a posterior incision in the costo-vertebral angle would have failed to drain the intraperitoneal abscess. Owing to the weak condition of the patient, after opening and draining the omental bursa from the front, it was deemed safer

not to prolong the operation by attempting drainage from behind. Perhaps it would have been better to have added a posterior incision, as it would have afforded better drainage, and would have been followed by a quicker recovery, as well as avoided the formation of a fecal fistula; but, as mentioned above, the patient's condition was such as not to allow of any prolonged operative interference. The fecal fistula was due to the mistaken zeal of one of the internes, who considered the drainage insufficient, and with every good intent substituted the rubber drain, and as a result fecal material appeared in the discharge two days thereafter.

The healing of the abdominal wound was thus materially delayed, and but for this complication the patient would have been discharged at least six weeks sooner.

On July 1st the pancreatic abscess was entirely healed, as at that time the discharge was mainly fecal and contained no pus.

The pancreatic abscess in this case was evidently a single one, as is the rule of 60 per cent. of reported cases, and the damage to the gland through suppuration was of limited extent, as can be appreciated by the present condition of the patient. He has steadily gained in weight, his digestion is good, his stools are of a normal consistency and color, the urine contains no sugar, and the pancreas apparently functionates in a satisfactory manner.

CARCINOMA LIMITED TO THE APPENDIX VERMIFORMIS; DISCUSSION OF ITS ORIGIN AND ITS RELATION TO APPENDICITIS.

By RICHARD H. HARTE, M.D.,
AND
ROBERT N. WILLSON, M.D.
PHILADELPHIA.

The following cases are reported as of interest not only from a pathological standpoint, but because of features that give them a direct bearing upon a disease that has become of late years almost as frequent in its occurrence as any one other pathological condition.

As appendicitis becomes more and more frequent, the interest in its etiology increases, not only with a view to an effective treatment, but equally with regard to prophylaxis; and as each new cause is discovered, some new field, pathological or therapeutical, opens, and the subject must be gone over anew.

By no means the least interesting of the causes of appendicitis is a primary malignant condition of the mucous membrane and its extension to the different coats of the appendix. The total number of cases in which the appendix has appeared to be primarily involved by a carcinomatous growth is still extremely small—in the neighborhood of thirty—and those in which the growth appears to have been limited to the organ comprise a still smaller number, perhaps in all not amounting to more than eight or ten unimpeachable cases, if so many. Moreover, the pathological interest is an unusual one, not only with regard to its possible bearing upon the etiology of appendicitis, but equally with reference to the causa-

tion of the carcinomatous growth. The question arises at once whether the carcinoma or the appendicitis has been the primary condition; and if the former whether, after all, the malignant condition consists of anything more than a perversion and overgrowth of the epithelial tissues, stimulated finally to to such an extent as to drain the system of fluids and nutritive substances that are needed in the general economy, and perhaps to form a toxin or toxins that go still further toward undermining the resisting power of the tissues. The tendency at present favors the theory of a parasitic or bacterial origin of most, if not all, malignant growths. The question arises, then, in the cases that are before us: Is it necessary that carcinoma be parasitic in its origin, in order to explain either the primary focus or the metastasis? The cases under immediate discussion were ones in which, as far as could be ascertained *intra vitam*, no malignant involvement had occurred outside of the appendix.

The clinical history will be given before we proceed with the discussion of the subject.

The first case was seen by Dr. Willson in private work, and then in consultation with Dr. Harte, who operated at a later date. The clinical notes were as follows:

Case I.—*September* 3, 1900. Miss ——, a young woman, unmarried, aged twenty-four years.

Family history absolutely negative. Mother died of pneumonia; father alive and well; brothers and sisters all healthy. No history of malignant growth on either side of family. Patient has had most of the diseases of childhood, among them measles, whooping-cough, diphtheria, and pneumonia (?). Menses began at fifteenth year; have always been regular as to time, but with considerable dull pain over the small of the back and in the pelvis. This usually extends over a week's time, of which two days are usually spent in bed. Has never had leucorrhœa. Was well and strong until her sixteenth year, when she went through what was probably a chlorotic stage of several months' duration. From that time she was well until her nineteenth year, when, *after a bicycle ride*, she noticed a pain in the right iliac region, at first sharp, then becoming dull and heavy and continuous. One week later she mentioned the presence of this pain for the first time, and was placed in bed. Diagnosis of appendicitis by attending physician,

and confirmed by a surgeon in consultation. Operation discussed, but set aside. Patient was in bed for over four weeks on this occasion, and then rose free from pain. During this attack there was neither diarrhœa nor constipation, the bowels remaining practically normal. At no time was there blood in the stools. From this time for over three years the patient appeared well and was free from all symptoms. The bowel movements were regular and normal.

One year ago, and during a period extending over the whole winter, the patient had attacks of pain similar to those of three years previous, but of less severity. Again, and on this occasion without treatment, the symptoms disappeared, and until last summer (four years and eight months from the date of the first attack) she appeared strong and unusually well.

At this time, and after a hard sight-seeing tour on the Continent, a severe, debilitating diarrhœa set in, and blood and mucus were noted in the passages. From then until the present date she has experienced pain in the appendicular region, extending less acutely over the entire abdomen, but centring over the appendix. Pain extends also upward and posteriorly over the right lumbar region. This lumbar pain she had noticed markedly in both of her previous attacks, as she now recalls.

One month ago her symptoms all began to gradually increase in intensity, and the patient has at length been forced to yield through alarm at her condition. She describes her pain as one of a spontaneous nature, varying in character, sometimes sharp, sometimes dull, but continuous in duration, and centring constantly over the region of the cæcum. Again, there is present the dull ache over the right lumbar region posteriorly, whether the patient is in motion or at rest. The appetite is irregular, and there is a slight diarrhœa. Temperature normal, pulse 78.

The blood examination showed: Hæmoglobin, 100 per cent.; red corpuscles, 5,120,000; white corpuscles, 6000. No malarial plasmodia present; no poikilocytosis; no nucleated red corpuscles.

Urinalysis: Acid, 1020; pale amber color, transparent; sediment scanty, white, flocculent; no albumin, no sugar, no peptone (Bruecke's), no albumose; microscopically, no casts, no renal epithelium, few leucocytes and squamous epithelial cells, no crystals.

On physical examination the patient is found well nourished, rather pale, slightly flushed over the cheek bones; conjunctivæ, and mucous membranes of the mouth and nose normal; no jaundice; skin clear

and healthy; cardiac dimensions and sounds normal; lungs absolutely negative; pulse regular (78), full, soft, and compressible.

Abdomen: Distinct tenderness on palpation, especially over the umbilicus and over the cæcum. On deep pressure in the latter region the pain is markedly increased and of a sharp, acute nature. A thickened colon and cæcum seem to be palpable under the fingers. Marked resistance of the muscles of the abdomen on the right side in contrast with the left. The spleen and liver very tender, but neither enlarged to percussion or palpation. Over the right lumbar region is an area of great tenderness, very sensitive to pressure. Patient has a constant dull ache here, and there is a seemingly distinct pain from that noted in the umbilical and iliac regions. No distinct mass can be felt in the iliac region, but a simulation of a thickened appendix can be constantly palpated, and forms the point most sensitive to pressure.

Further physical examination negative.

The patient was placed in bed, on liquid diet and a pill of calomel, gr. $\frac{1}{16}$; morphine, gr. $\frac{1}{16}$; sod. bicarb., gr. j, every four hours. Applications of heat and cold both proved so disagreeable to the patient that it was decided to dispense with their use.

8th. During the first few days a marked improvement. Abdomen less sensitive. Still has severe ache over right lumbar region. Much less sensitive over the cæcum. Diarrhœa has disappeared. A trace of blood has only once been seen in the bowel movement.

Blood examination showed: Hæmoglobin, 100 per cent.; red corpuscles, 5,200,000; white corpuscles, 6500; no poikilocytosis; no nucleated red corpuscles.

16th. Abdominal symptoms seem to be slowly clearing up. Pain and ache have disappeared from the right lumbar region, and almost entirely from the abdomen. Deep pressure still elicits tenderness over the cæcum. All of the region along the false ribs on both sides is exquisitely tender to pressure, as if due to a rheumatic process. Bowels moving regularly. No blood in the stools. Sod. salicylate, gr. v, every third hour.

24th. No pain at any point in abdomen except over appendicular region, and there only on deep pressure. Pain along costal border has disappeared. Diet slightly increased. Bowel movements slow and constipated. Small scybalæ passed; no blood. Calomel, gr. $\frac{1}{24}$; eserin sulphate, gr. $\frac{1}{120}$.

26th. Patient sat up in bed for first time. Some soreness over ap-

pendix, but no active pain at any point. Bowel movements normal; good appetite. All medicines discontinued.

28*th*. Sat up in chair for short time. No return of pain, but seemingly an increasing soreness on palpation and tenderness over the cæcum. This is relieved in the erect posture, and becomes more marked when lying down.

30*th*. Walked slowly down stairs and without discomfort other than a slight dizziness. No active pain, but a constantly increasing tenderness over the cæcum. Bowel movements regular and of normal appearance.

October 1. Walked a few moments in the fresh air and returned tired, but refreshed. Massage of the abdomen twice daily with ung. ichthyol. et iodi comp. Marked tenderness over the appendicular region. No spontaneous pain at any point.

2*d*. Palpation of appendix seems to show a markedly sensitive mass that rolls beneath the fingers (compare operative findings). No other point very sensitive, though general tenderness seems to be gradually returning. Old and dull pain over the left lumbar region has again appeared. Temperature and pulse normal.

Blood examination showed: Hæmoglobin, 98 per cent.; red corpuscles, 4,900,000; white corpuscles, 8000; no poikilocytosis; no nucleated red corpuscles.

8*th*. Throughout the past week the abdominal condition has varied slightly. Pain has gradually increased over the abdomen and right loin. The most sensitive point remains fixed over the cæcum. Pain is now constant and sharp, with and without pressure. Blister applied over cæcal region.

Urinalysis: Acid, 1017, amber color, transparent; sediment scanty, white, flocculent; no albumin, no sugar, urea, 2.10 per cent., marked phosphatic precipitate, with heat; no casts, no crystals, few leucocytes, few squamous epithelial cells.

10*th*. Patient seen in consultation with Dr. Harte. Examination elicits findings similar to those already reported, and in addition a possible reference of the lumbar pain to the right kidney, determined only by change in position. Pain over the appendix still persists, though the character of the two seems even more distinctly differentiated, the latter being much the more sharp and stabbing. Diagnosis: Appendicitis and possibly a floating kidney.

11*th*. Patient again seen in consultation with Dr. Harte. Pain over right lumbar region and abdomen much increased by examina-

tion of previous day. Temperature, 99°; pulse continually over 80; respirations normal. No indication of a suppurative process.

Blood examination showed: Hæmoglobin, 100 per cent.; red corpuscles, 4,700,000; white corpuscles, 10,000. Diagnosis confirmed and operation for appendicitis decided upon afternoon of same day.

Patient removed to hospital in carriage. During the night had a slight chill and continuous attacks of vomiting, evidently due to nervous apprehension. No change in physical condition.

12*th*. Was easily anæsthetized with ether and was operated upon by Dr. Harte about 2 P.M. Appendix removed. Before removal two soft concretions (fecal) were expressed into the bowel.

The subsequent history of the case was without event from a clinical point of view. The wound promptly healed, and at the end of two weeks the patient was transferred to her home, sat up in her chair, and from this point on proceeded with an uninterrupted convalescence.

As a matter of routine only, the appendix was examined and the following notes were made:

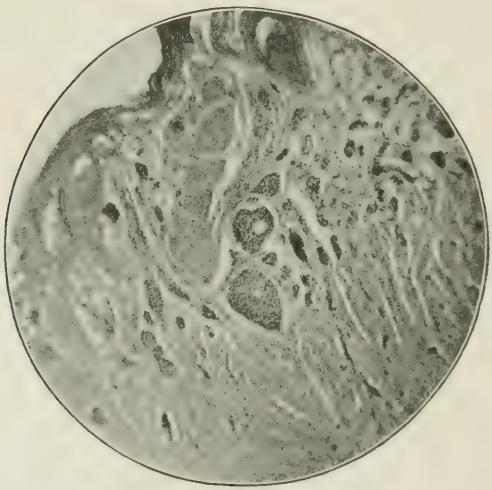
Length from the extreme tip to the intestinal opening, 15 cm. *No adhesions at any point.* No constriction; no new-growth visible; no solid concretions present (two small, soft concretions having, however, been expressed into the bowel at the time of the operation, see above). The appendix lay behind the cæcum, and pointed upward and to the right. At no point was there any indication of suppuration or the beginning of adhesion formation. No enlarged glands were palpable. Bowel, mesentery, and peritoneum all appeared normal. Except for the great length and a slight twisting upon itself as it lay in the abdomen, the appendix appeared normal to the eye. The lumen was, however, closed for almost the entire length of the organ.

Microscopical sections were made from five different localities. That immediately adjacent to the bowel showed a lumen still patulous. There were evident signs of a high degree of inflammation, a marked proliferation of the glandular elements, and considerable round-cell infiltration. About 1 cm. from the opening into the bowel the lumen had already disappeared, and the tissues were in the first stages of a necrotic process. A few of the glands of Lieberkühn still persisted, and many small round cells were to be seen; everywhere, however, there was widespread necrosis.

From this point to within 1 cm. of the tip of the appendix there was no lumen. The tissues became more and more necrotic as the tip was approached, until all traces of the mucosa and submucosa were lost.

About 1 cm. from the tip of the organ, and over a distance of about 0.5 cm., sections were obtained that showed an extensive carcinomatous infiltration of the scirrhous type. Nothing was to be seen in this area macroscopically other than an appearance identical with that on each side of the new-growth, where no signs of malignancy were to be found. Starting in the remnants of the glands in the old

FIG. 1.



Case I., showing carcinomatous infiltration of the muscularis, etc.

mucosa, columns and nests of large ovoid and round epithelial cells arranged themselves through all the coats of the appendix, reaching even the serosa, and at certain points extending into it. The area formerly occupied by the lumen was altogether taken up by the necrotic mass, throughout which ran in every direction small columns and nests of the same epithelial cells. The nuclei of the latter stained intensely with hæmatoxylin. The blood supply was fairly good in the portions of the appendix that were not necrotic.

On both sides of this microscopical area of tumor-formation the sections showed absolutely no malignant infiltration. The lumen, how-

ever, was completely gone, and the centre of the organ was occupied by necrotic tissue as in the proximal portions. At no point was a foreign growth macroscopically apparent, either within or without the appendix.

A second case, also reported for the first time, and similar in many respects to the preceding, came to the attention of Dr. Robert G. Le Conte, in his service at the Pennsylvania Hospital, and we are indebted to him for permission to publish the clinical history.

Case II.—Frank L., aged twenty-five years, grocer, was born in Russia, and as a child was always well and strong. No history of malignant disease in his family. Father and mother living and well, also several brothers and sisters. Patient had none of the diseases of childhood, and until one year before admission to the hospital had never been ill. No history of trauma of even the slightest nature. Eight months ago experienced pain in the abdomen, often localized in the right iliac region, and described as cramps. Never had either diarrhœa or constipation. Never at any time was blood noted in the stools. The attacks of pain were increasingly severe and intermittent until the present time, when they have led the patient to ask hospital advice. During the preceding eight months has been under the care of a physician for the pain already mentioned, but has obtained no relief. On November 11, 1901, his present attack has lasted two days, and is of the same indefinite cramp-like nature, localized mainly in the right iliac region. The physical signs are those of an acute attack of recurrent appendicitis now in the third day. A mass can be felt in the right iliac fossa, with the gut overlying it.

Operation, November 15, 1901. Incision at McBurney's point. Appendix was beneath the cæcum and bound down in the pelvis, and was found to be ruptured at one side near the tip. It contained a small concretion about the size of a grape-seed. The end was thick and fibrous. Some brown fluid with a fecal odor came to the surface when the peritoneum was opened. The appendix was excised and the stump invaginated, the cavity and space around being packed with iodoform gauze. On November 18th the packing was removed and the patient's condition good. The outer packing was removed at a later date. A sinus formed, and was treated at first in the wards and later at the dispensary. The following report was made by Drs.

Flexner and Longcope upon the appendix removed at the operation: "Diagnosis: Primary carcinoma of the appendix; acute suppurative appendicitis. Sections through the wall of the appendix about 1 cm. from the tip show the following condition: All the coats of the appendix are completely necrotic and indistinguishable. Covering the internal surface of the appendix is a mass of necrotic material, fibrin, polymorphonuclear leucocytes, and fine fibrin threads running in all directions. On approaching the peritoneal portion of the appendix the fibrin threads become denser and the leucocytes fewer in number.

FIG 2.

Case II., showing origin of the growth from the glands of the mucosa.

Epithelioid cells began to appear, and still nearer the peritoneal portion become more and more prominent, assuming an elongated character, until finally the tissue presents the appearance of newly formed fibrous tissue, infiltrated with a moderate number of polymorphonuclear leucocytes and clumps of small round cells. In the deeper portion of this tissue is an area containing numerous irregular alveoli of epithelial cells. Some are long and narrow, filled by only two or three rows of cells; others are large, irregular, and packed with many cells. The connective tissue between these cellular masses varies markedly in amount,

here and there predominating the section or sometimes only separating the cell nests by a few fibres. The individual cells are polygonal in shape, with a small rim of palely staining protoplasm around the nucleus, which is usually oval and vesicular. No nuclear figures are observed. The tip of the appendix is seen to be the point of origin. The surface epithelium is here intact, and except at one point the glands of the mucosa are normal in appearance. The mucosa is here thickened, and scattered through it are small, irregular masses of cells identical with those already described in the other portions of the appendix. The cells at the periphery of these nests in the mucosa are of a high columnar type, with oval vesicular nuclei; but toward the centre they become polygonal, with large round or oval palely staining nuclei. No basement membrane is present. Irregular projections of carcinoma cells extend from these islands of new-growth between the greatly swollen lymphoid follicles and infiltrate with a diffuse growth the deeper portions of the mucosa. The muscular coats are slightly invaded. In other portions of the appendix small areas of new-growth are found lying in the submucosa, the muscularis mucosa separating the growth from the mucous membrane in all instances, and thus demonstrating their secondary nature."

The patient was examined by one of the writers, through the courtesy of Dr. Le Conte, about February 1, at which time the scar was healthy and the patient was wearing with comfort an abdominal belt. On palpation the abdomen was absolutely normal, except for a hard nodular mass to the right and below the old scar. This the surgeons deemed to be a formation of fibrous inflammatory tissue. In March, 1902, he was admitted again to the hospital with symptoms of obstruction of the bowel. Operation was performed and a fibrous band of adhesion was found occluding the bowel above the cæcum. The intestine was nearly gangrenous at this point. Death occurred on the same day. At the time of operation there were no discoverable signs of recurrence of the malignant growth. No autopsy was permitted.

It may be well at this point to review the literature upon the subject, and where possible to compare similar cases with the two immediately under discussion. Most striking in the few cases on record has been the absence of any symptoms that would definitely point to the condition actually present. It has already been stated that only in a very small number of all the reported cases of appendicular carcinoma has the process been

limited strictly to the organ; but in the few that have been similar in this respect there have invariably been present indefinite symptoms only, and such as belong to an appendicitis of the usual type.

I can find, after a careful search of the literature, only sixteen other cases of carcinoma probably limited to the appendix, and, as previously mentioned, even in some of these it may well be questioned whether the growth was actually limited to or even primary in the organ. Of these A. O. J. Kelly[1] reports 2; E. Hurdon,[2] 1; Letulle and Weinberg,[3] 2; Rolleston,[4] 1; Mosse and Daunic,[5] 1; Wright,[6] 1; Leichtenstern,[7] 3; Nothnagel,[8] 1; Maydl,[9] 1; and Goffe,[10] 1. To several of these Kelly has already called attention in his discussion of the tumors of the appendix. In Wright's case there was extensive suppuration in addition to adhesions, and a perforation near the juncture with the bowel. In a third case reported by Kelly, and not included in this list, there was the same picture of suppuration and adhesions, with a miliary studding of the bowel and peritoneum by the growth—probably secondary to disease elsewhere in the body. But in all the cases that we have submitted the symptoms were those of an ordinary relapsing appendicitis, and in none was the actual condition suspected. A few resembled the case reported in this paper in the complete absence of a tumor evident to the naked eye. In several instances a small tumor was present that was usually mistaken for a concretion within the lumen of the appendix until the latter was laid open.

A number of other cases will be referred to in the bibliography at the end of this article in which the appendix was involved, and perhaps primarily, but in which also the possibility existed of a different location for the original focus of the disease, and in which certainly the process was not limited to the appendix at the time of operation. Cases in which there has been present also an involvement of the uterine appendages, or of the intestines, or of the peritoneum, can hardly be looked upon as even probably originating in the appendix itself, and cannot, therefore, be considered as among the conditions to be included as primary carcinomata limited to the organ.

As a matter of record and comparison an abstract of the cases reported by Goffe, Kelly, Hurdon, Letulle and Weinberg, and Rolleston will be of interest. That noted by Goffe bore a striking resemblance to the two cases primarily emphasized in this paper.

A young Jewess, aged fifteen years, unusually well developed and well nourished. For more than a year has had increasing pain in the appendicular region, caused by any ordinary exertion. Diagnosis, chronic appendicitis, and operation advised, although no tumor was palpable. The possibility of involvement of the uterine appendages was reserved. Operation, December 4, 1900. The appendix was found to be unusually long, thickened, and tortuous. At the extreme tip could be seen through the peritoneum a round white body the size of a large marrowfat pea; this felt to the finger like a calculus. On section it appeared macroscopically like a fibroid tumor, and evidently had developed in the tissue between the mucous membrane and the peritoneum. The pathological report stated: "Acute appendicitis throughout the organ, no evidence of chronic inflammation discoverable. A small spherical nodule, 5 mm. in diameter, was found at the extreme tip, which upon microscopical examination proved to be carcinoma of quite a typical character. The growth appeared to intrude wholly upon the lumen of the appendix, the muscular coat remaining unaffected except," etc. The patient's grandmother died of carcinoma of the uterus, her sister of carcinoma of the breast; there was no other malignant history in the family. The patient convalesced promptly and has been entirely relieved of her former symptoms.

Kelly's cases showed the following features:

Case I.—Clinical history lost. Appendix removed by operation February 19, 1898. Length of appendix, 11 cm.; exterior diameter at proximal end, 8 mm., this being maintained for about 3 cm. Then it increases to 1.2 cm. and continues so throughout the remainder of its length. The organ is irregularly distorted, and the wall of its proximal two-thirds is of a greenish hue, soft and necrotic. The lumen measures 4 mm. at the proximal end, and gradually decreases to 1 mm. at the tip; the mucous membrane much congested and ulcerated toward the proximal extremity. Toward the tip the inflammatory phenomena are much less marked. The lumen contains a

small amount of mucopurulent material. Cultures showed a pure growth of colon bacilli.

The microscopical examination showed a high grade of ulcerative appendicitis, and at the distal portion an area of tumor formation about 6 mm. in diameter, involving only the mucosa and submucosa. Slight persistence of the glands of Lieberkühn. Diagnosis: Carcinoma. Cells polyhedral, some large and ovoid. Solid masses of cells in alveoli.

Case II.—Man, aged nineteen years; family history negative; previously well. Eight days before admission seized with cramp-like abdominal pain. On the third day vomited a small quantity of frothy mucus, and pain became localized to the right iliac fossa. Pain relieved by flexing right thigh. Some abdominal distention and tenderness in right iliac fossa, marked rigidity of right rectus muscle, an area of dulness on percussion, and on palpation a mass about three inches in diameter in the right iliac fossa. Temperature, 102° F.; on next day, 103.2° F. At the operation on the next day the head of the colon and the appendix were found surrounded with pus, which was evacuated and the appendix removed. Recovery.

Pathological Report: Appendix, 5 cm. in length, and about 1 cm. thickness throughout its entire extent, much congested and inflamed and covered with fibrino-pus, much distorted; microscopically, lesions of ulcerative appendicitis, and toward the base of the appendix a small growth, "which in the cross-section occupies hardly three-fourths of the microscopical field of an AA Zeiss objective and a No. 2 eye-piece."

Situated entirely within the submucosa, the mucous membrane being nearly intact, are solid masses or nests of cells, some relatively large. The cells are epithelial in type, of moderate size, and their nuclei are vesicular and stain well. In some sections there is a slight infiltration of the muscularis.

Both of the foregoing cases seem to be genuine examples of a limitation of the new-growth to the walls of the appendix, and through the kindness of Dr. Kelly we have had the opportunity of comparing his sections with those from our own cases. The purulent effusion in his second case seems to indicate at least an extension of the inflammatory processes to adjacent and surrounding structures.

Much more typical even of the ordinary appendicitis is the description of the following case reported by H. D. Rolleston.[4]

Woman, aged twenty-six years, in her fourth attack of appendicitis, the first having occurred in January, 1899, and the last on March 26, 1900. The appendix was removed on the following day (March 27). No account is given of the clinical symptoms nor of the physical signs; simply the statement that they were those of an outspoken, relapsing appendicitis.

The appendix showed slight peritoneal adhesions connecting the apex of the organ with the posterior surface of the uterus. No enlarged glands were present, nor was anything that suggested a secondary involvement seen at the time of operation. When the appendix was cut open a globular mass a little larger than a marble was found near the apex, arising from the mucous membrane, somewhat caseous in appearance and suggesting tubercular disease. Patient recovered from the operation, but during the middle of April had erratic temperature, with some pain in the left side of the abdomen. This subsided, and she went to a convalescent home in May. News was had recently (June) that the patient was losing flesh, and possibly secondary growths were developing in the abdomen.

Examination of the appendix unexpectedly showed the growth to be a spheroidal-celled carcinoma, limited in portions to the mucous membrane, and elsewhere extending to the muscularis and almost to the peritoneum. There was no extraperitoneal involvement.

This case resembled those reported by Kelly, and showed in a still more marked manner the limitation of the growth and its point of origin. The tumor was evident macroscopically, but only after the laying open of the organ. The clinical picture was not given in detail, but was undoubtedly one that suggested nothing more than a chronic catarrhal condition of the appendix.

E. Hurdon's[2] case, seen in the service of Dr. Howard Kelly, goes a step further in the similarity of the clinical pictures, and again presents a growth that was discovered only after removal from the body.

Woman, aged twenty-four years; married nine years; II-para. One brother died of carcinoma of the leg. Patient always well until birth of first child; then at varying intervals experienced pain in the back and abdomen. This was of a dragging nature. Last spring she had a fall, and the pain, which had been limited to the pelvis, now became more marked, and was situated higher up in the right iliac fossa.

Right kidney palpable and slightly movable. Uterus in acute retroflexion; its mobility restricted. Further examination negative.

At the operation (February 21, 1899) Dr. Kelly released the pelvic adhesions, suspended the uterus, and removed the appendix. The uterus and tubes were bound down, especially on the right side. No cause discoverable for pelvic peritonitis until the appendix was found hanging into the pelvis, enveloped in dense vascular adhesions. A shortened meso-appendix caused the outer third to redouble on the inner portion, and at the point of flexion there appeared to be a foreign body in the canal. The appendix was amputated close to the cæcum. Uneventful recovery.

In December, 1899, the patient had gained twenty-three pounds, and her general health was excellent. There was still some discomfort in the right lumbar region, evidently due to the movable condition of the kidney. At the present time of writing (May, 1901, more than two years after the operation) Dr. Hurdon writes: "The patient is enjoying good health and shows no evidence of recurrence."

The appendix was 10 cm. in length. About the juncture of the middle and outer thirds it was flexed within a broad band of adhesions. Proximal end normal. The portion beyond the flexion was distended, and contained a soft concretion about the size of a date-stone. Also a small tumor, in the form of an oval swelling, impinged upon the canal, and appeared to the naked eye about 1 cm. long and 5 mm. broad. The cut surface showed a whitish appearance. Under the microscope the growth was seen to be the ordinary type of glandular carcinoma that is so customary in the mucous membrane of the bowel.

This case bears a great resemblance to the first one that has caused the writing of this article. Not only the clinical history, but the special lumbar symptoms referred to a floating kidney, and the flexion of the appendix showed striking similarities. The two cases differ absolutely in the presence and absence of adhesions and surrounding inflammation, carcinomatous or otherwise. Both were in women in their twenty-fifth year.

Letulle and Weinberg[3] report twelve cases of obliterative appendicitis from their histological aspect, among which they unexpectedly found two cases of carcinoma developing at the level of the cicatricial obliteration of the tube. In neither case

did a malignant growth enter into the discussion as worthy of consideration prior to the microscopical examination. The foregoing instances will suffice to show that cases do occur in every-day practice, and in all classes of life, which, while simulating appendicitis in their clinical features, may all the time constitute the manifestations of a malignant growth that is gradually making headway toward a fatal involvement. A. O. J. Kelly[1] has called attention to the fact that out of 20,480 autopsies performed in the Allgemeinen Krankenhaus in Vienna for the twelve years from 1870 to 1881, there were 1460 cases of carcinoma, of which 100 affected the intestinal tract, and of these only one involved the vermiform appendix alone (Maydl[9]). Also to the statistics of Nothnagel,[8] for the same institute, from 1882 to 1893. During this time 20,358 autopsies were made and 2124 cases of carcinoma noted, of which 243 were of the intestinal tract. Only one affected the vermiform appendix.

Whipham[10] reports a case of extensive involvement of the intestine and peritoneum, which he believes to have originated primarily in the appendix. He notes an ovarian involvement, which he speaks of as "probably secondary," in spite of the fact that the reverse would be the natural order of probability.

Mosse and Daunic[5] report a case limited to the appendix and devoid of all appendicial symptoms. The patient died of cardiac disease, and, as has so often happened, the appendicular growth was discovered only because of the routine examination.

Rolleston[4] refers to a growth of the appendix reported by Gilford[11] as having been probably a mass of inflammatory tissue and not malignant. From the original description we are inclined to think, with Rolleston, that the case was neither one of carcinoma nor sarcoma, as claimed.

J. H. Wright,[6] however, has published an account of a case seen by him that undoubtedly comes under the heading of appendicular carcinoma. The clinical history was one of purulent peritonitis of obscure origin. The autopsy failed to reveal any definite starting point for the purulent effusion.

The appendix showed some adhesions, but there was no evidence of perforation. As a matter of habit, the appendix was sectioned and a

"small primary carcinoma" found in the head of the appendix. "At the junction of the tumor with the wall of the gut" a perforation was then found "which was undoubtedly the starting point for the peritonitis." The muscularis was infiltrated with the cancer cells, and the tumor followed out the characteristics of an adenocarcinoma.

Lafforgue[12] collected nine cases of appendicular carcinoma, some of them of doubtful accuracy, and Leichtenstern[7] three cases.

Finally, A. Beger[13] has reported a case from Thiersch's clinic that is of interest in that it resembles our first case of our series in its slow development, though when the appendix was removed the tumor had attained to a large size and was no longer limited to the appendix.

Man, aged forty-seven years. A mass was evident in the right iliac region for three and one-half years. Severe pain. On incision one litre of odorless pus was evacuated. The opening would not close, a fistula formed, and exuberant granulations around it. No digestive symptoms other than constipation were present.

The physical examination showed a tumor the size of a fist over the appendix; the surface of the abdominal wall was lacerated. A small portion of the tumor was excised and examined. Diagnosis: Adenocarcinoma of the intestine. The appendix was 6 cm. long, finger thick, the peripheral end much enlarged. The serosa was nowhere perforated by the growth. The wall showed inflammatory hyperplasia, the central portions forming an abscess wall and surrounding the purulent collection in the new-growth. Patient died. The autopsy confirmed the above, except that there were found to be present also a general peritonitis and a carcinomatous infiltration of the glands.

If we would summarize, we obtain the following facts and figures. By extending the meaning of the term "limited to the appendix" to include all cases in which there is distinct evidence of tumor formation only in the organ itself, *i. e.*, including cases in which there may be vascular adhesions, suppurative peritonitis, hyperplastic glands, etc., but not yet a true development of malignancy elsewhere than in the appendix, we are enabled to classify under the above head-

ing as follows: Nothnagel,[8] 1; Wright,[6] 1; Maydl,[9] 1; Letulle and Weinberg,[3] 2; Leichtenstern,[7] 3; Mosse and Daunic,[5] 1; Kelly,[1] 2; Hurdon,[2] 1; Rolleston,[4] 1; Ziemann,[14] 1; Goffe,[10] 1, and the present cases 2; in all 17 cases. Of these, several might easily be called into question, reducing the number still further if a rigid line were drawn; for in exceptional instances only is mention made of a thorough examination of the abdominal contents for other foci of malignancy. As only a small number have as yet given an opportunity for study on the autopsy table a statement as to the probable limitation is all that can be made. Even if we include cases in which the appendix has been *chiefly* concerned, and in certain of these by an admittedly secondary involvement, we can find only in the neighborhood of 30 cases all told. Kelly has called attention to those of Merling,[15] Rokitansky,[16] (4), Prus,[17] Beger,[13] Draper,[18] Stimson,[19] Mosse and Daunic,[5] Wright,[2] and Cullen.[20] Also to a questionable case of Monks.[21] We have already mentioned Lafforgue's nine cases of which several are included, with no propriety in such a classification.

Kelly[22] has himself made a most careful study of appendicitis in general; and in sectioning 706 appendices in cases operated upon in the German Hospital, Philadelphia, has met with only three cases of carcinoma of the appendix, two of which are mentioned in the above list.

These figures indicate that the condition is decidedly rare, and yet we are inclined to attribute to it much more clinical importance than would at first seem to be warranted. In the first place, appendicitis has been considered an operative condition for too short a time to afford opportunity for a thorough study of the relation of malignancy to its etiology, even had advantage been taken of every occasion for microscopical examination, which is far from having been the case. Only during the past two or three years has there been any careful histological study of appendices after their removal on the operating-table; and even now it may almost be said that nine appendices out of ten are destroyed without microscopical study. The fact is a pregnant one that out of the thirty and odd cases fully two-thirds

of the number have been discovered since 1890; and of the 17 cases that we admit into the number of those probably limited to the appendix, all except 1 have been noted since 1895, and 10 since 1898. *Of the latter* 10, 6 *have occurred within the last eighteen months.* All of these facts point to one conclusion. As the custom grows of examining microscopically every bit of pathological tissue that leaves the operating-table, we find much more frequently conditions that have been considered rare. Five years ago an appendicitis was either acute or chronic; then it became catarrhal, ulcerative and obliterative. Now room has to be made for carcinomatous appendicitis, or perhaps more accurately, "inflammatory carcinoma" of the appendix. This leads us directly to a discussion of the origin of the growth in the appendix, and from that point still further to the clinical aspects of the condition.

First of all, what may be the *cause* of a primary carcinoma of the appendix? The many theories applied to the causation of carcinoma in general of course come readily into view; and as each advances it must be promptly set aside until we arrive at last at a point between two possibilities, neither of which can as yet be definitely established. Taking for example our own case as a fair one for consideration, we must pass over at once the congenital theory of Cohnheim as impossible. Trauma is not to be considered in the case. Heredity can have no place. The age itself was against malignancy; and certainly there was no true tumor dyscrasia in a case that had required five years or more for the development of a microscopical tumor, although the interior of the entire appendix was necrotic. So that we come naturally to the only two remaining theories; the one of a parasitic infection, and the other of an inflammatory overgrowth of the epithelial structures, accompanied by a perverted metabolism that eventually must result in both an extension of the growth and a poisoning of the system. To assume the former as the correct theory we must admit that the parasites were present in the appendix, or at least in the system, for not less than five years, and that at the end of or during that time they were only able to form a growth so minute that it still

required the microscope for its discovery. This theory at the same time implies the presence of animal organisms that can survive during five years of combat with the fluids of the body, and yet are at a standstill as regards their own multiplication, a thing that is hard to conceive in the light of our present knowledge of the manners and customs of pathogenic bacteria and protozoa. We make this statement in the full knowledge of the fact that during the past few months a new parasite has been offered to the medical profession as an explanation of the origin of malignant disease. Much more logical seems the sequence from a primary inflammation (especially in our own case) and a carcinoma secondary to or developing out of it, than a primary carcinoma and a secondary inflammation.* Moreover, the improvement that constantly follows operations in cases of malignant disease, even though temporary, supports this theory, while at the same time rendering less plausible one of a parasitic origin. The removal of the focus of active inflammation will retard and perhaps cause to cease temporarily, or perhaps permanently, the exaggerated proliferation of epithelial structures. Whereas the same active procedure, except in the way of removing unhealthy tissue, would only offer new and perhaps, up to that time, uninvolved surfaces to an infectious process, by virtue of the progress of the knife and the shock involved in all major operations.

If it once be allowed that a simple inflammation may have been present for years, whether catarrhal or of any other type, it is easy to imagine its semiquiescence during that time, until at last during an unusual disturbance of the bodily or local nutrition it breaks down the resisting power of the tissues, as so frequently happens in other portions of the body. This

* After this article was in type the writers saw together a case that bears directly upon this point, in a woman who had suffered for years from ovarian colic, with a vague history of an attack of appendicitis twelve years before. At operation a cystic ovary was removed and a thick, short appendix that had evidently been the seat of repeated attacks of inflammation. In the tip of the latter a small tumor was observed, encroaching upon the lumen, which on microscopical examination proved to consist of inflammatory connective tissue. No malignant change could be detected. The mucous membrane had disappeared from almost the entire lumen of the appendix.

dormancy we cannot so easily assume for carcinoma, once it is developed in the body. We must consider, however, the possibility of a chronic inflammatory condition, long present, that has so depleted the resisting power of the appendicular structures that the latter finally become susceptible to a passing infection. It will no doubt be claimed that in such a condition the objection that the carcinoma parasite, in order to have had any influence, must have remained idle for many a day, becomes groundless; and that if there is indeed such a thing as a causal parasite, now is the time when it will most likely exert its influence should it happen to be present at this particular period. Such an argument is impossible of definite answer, because it states only a possibility. The assertion, however, carries no weight of probability with it; and at least to our minds the theory of an inflammatory origin offers so much more simple and likely an explanation that it seems unnecessary to go out of our way to search for a causal organism. After all is said, the most telling argument against the parasitic theory is the failure of such growths to show a predilection for metastasis through the circulation, rather than by direct extension. Metastases do occur in this way, but by no means so often, and we do not need to go to greater trouble than to examine the blood repeatedly in such a case in order to find there cells that have left the mother focus, which by their very nature must spread the unwholesome influence, whatever it be, to the tissues that form their lodging place. Moreover, Dock's studies * have recently shown that many of the cells previously considered as "carcinoma cells" can be caused to appear on the pleura and other structures by exciting simple inflammatory processes; and that neither these nor cells from a carcinomatous mass can be distinguished from ordinary epithelial structures except when found in mass and in typical arrangement with others of their kind. Bacteria or sporozoa or fungi may be carried too, and no doubt often are, in the circulation; but that there is a specific organism in and behind the new process seems highly

* American Journal of the Medical Sciences, June, 1897.

improbable, and still less likely of demonstration. Ribbert * takes the ground that parasites play no part in the development of a carcinoma after the primary irritation and inflammation have been set up in the connective tissue. By means of this inflammation the organic relation between the epithelium and its basal structures is severed, and the epithelium thus becomes, apart from its need for nourishment, independent of the body. This stimulates at once its natural and independent tendency to proliferate. He then adds that possibly there may be a specific micro-organism causative of the primary connective-tissue inflammation, but that its influence does not extend to the proliferation itself. This is as much as to admit (and we hold this as the most likely solution of the question) that any micro-organism may start an inflammatory reaction under certain circumstances, which, under favorable conditions may develop into carcinoma. There are perhaps few, if any, malignant growths that do not yield cultures of the ordinary pyogenic organisms. Probably these find a favorable nidus at a time when the tissues, owing to one cause and another, are non-resistant and simply take advantage of their opportunity. Von Marschalko † holds that the so-called plasma cells (which are probably nothing more or less than fibroblasts) in certain conditions undergo hyaline change and present the forms that have been named cancer parasites by many writers. This again coincides with our view; as the plasma cells have been shown to be most probably derivations from the lymphoid cells, and the latter, as is well known, are found massed around old and chronic inflammatory foci, sometimes to the exclusion of the polymorphonuclear variety. The boundary between hyperplasia and malignancy is at best a very narrow one, and where the epithelial tissue is ready at hand, as in the mucosa of the appendix vermiformis, it needs only the torch to light up a conflagration such as we may here picture. Grant also a necrosis already under way in the surrounding tissues, and a consequent refusal to supply assistance in the form of nourishment for the diseased

* Deutsch. med. Wochenschr., November 21, 1901.

† Arch. f. Derm. u. Syph., 1900, Bd. lxiv, Heft 2 and 3.

structures, and there is nothing left to hinder the epithelial bands from forcing their way in every direction into the surrounding unprotected territory. Proliferation is as natural with epithelium as mischief-making with the pyogenic organisms, and, only allowing that the surrounding tissues are devoid of their native resistant energy, the irritated epithelium may be expected to advance in its overgrowth as promptly as the barriers are let down. Apart from the local condition the first patient considered in this paper was in superb physical trim. Even at the time of the operation her muscular development was one to be envied, the blood picture unusually good, and not a bodily function disarranged. Evidently in such a case even a malignant growth must choose a slower gait than is its wont. It is well known, moreover, that intestinal carcinoma pursues a slower and, if the expression may be used, a more benign course than that of other portions of the body. But that it can lie dormant for the time required in this instance, and be discovered at last only by accident, is more than one should be asked to believe. Nor is it conceivable that a specific organism, at work for even a short time, not to mention five years, could fail to transmit others of its species, as well as its toxin, to other portions of the body. And yet not a single gland in the abdominal cavity could be palpated. Certainly these cases would seem clinically and pathologically to point away from a parasitic origin, and toward a purely inflammatory and hyperplastic beginning of the growth. Had the patient been older, and had the growth been more extensive, and to a degree commensurate with a portion of the time during which inflammatory symptoms were present, the parasitic theory could find ground for a resting place. But with only ¼ cm. of progress in five years, no peritonitis, no enlargement of the glands, no adhesions, a perfect blood picture, and no involvement even of the structures continuous with a chronically inflamed appendix, the foundation for a parasitic explanation becomes almost as microscopical as the tumor itself.

Our belief is and must be that the original focus was a catarrhal inflammation, probably due either to fecal or other

obstruction, or to extension from the bowel, and that the carcinomatous change took place subsequent to and entirely as the outgrowth of the former process.

In concluding our paper it will be interesting to briefly discuss the diagnosis, treatment, and prognosis of the condition.

Can the condition be diagnosed in its early stages? We believe not, unless the ground be taken that every appendicitis presents the danger of malignant disease, and an incision be made for the purpose of diagnosis. Even then, in these cases as well as in those of Goffe, Kelly, and at least one or two others, the only means of diagnosis lay in the removal and microscopical examination of the appendix.

The clinical symptoms were those purely and simply of recurring appendicitis. The patient's age was against carcinoma (it will be noted that in a considerable number of the cases quoted the age has been that of young puberty) and the condition, except for the pain and tenderness, was excellent. The stools were not characteristic. The urinary examination throughout the entire period was absolutely negative. The blood in the first case was hyper-healthy, if a high percentage of hæmoglobin and a high count of red and white corpuscles can be looked upon as a criterion. Only on the last day was there a suspicion of a leucocytosis, though, unfortunately, no differential count is recorded. The absence of an absolute leucocytosis is hard to explain, though it may have been dependent upon a partial lack of power to assimilate the food. Thus, in spite of the presence of necrosis and a malignant disease there was no indication in the blood of an inflammatory process in the system. Equally interesting was the absence of nucleated red corpuscles and poikilocytosis. The mass that seemed to be palpable, clinically, was altogether wanting when the abdomen was opened, and rendered only more astonishing the final discovery under the microscope. The glands were at no point enlarged.

The symptoms, therefore, as well as the physical signs, all joined in pointing to a recurring appendicitis, and had carcinoma been considered, as was not the case, it would have

promptly been ruled out as impossible under such conditions of nutrition and development.

Later on in such a case the condition may become plain enough, as in one of the instances quoted above; but the diagnosis then comes too late to be of service. "Either early or of no avail" must be the guiding principle in this as in all other forms of carcinoma.

The *treatment*, in the light of the above facts, rests itself at once upon two alternatives: either the radical school of surgery gains a point by finding in this an additional reason for immediate operation as soon as appendicitis is diagnosed and as a prophylactic measure, or else the conservative must lean upon the comparative rarity of the condition.

Some will say that if out of 706 cases sectioned for Deaver by one pathologist only three carcinomata were discovered (beside one sarcoma and one endothelioma of the organ, which do not directly concern us in this connection), the number and danger do not justify a wholesale attack upon the appendices of mankind. On the other hand, we ourselves have been able from the literature of the last five years to collect a number of cases, always increasing in the yearly ratio, and as more appendices are examined it bids fair that more will be found.

The question, therefore, is no trifling one. If a carcinoma such as was found in these cases by accident will later involve the bowel and peritoneum, and certainly cost the patient her life, and, again, if by removal at an early date the operation presents only the ordinary danger of an abdominal section and etherization, then the surgeon has thrust upon him a new responsibility. And when the medical man deliberates in regard to the best mode of procedure, he must think twice before finally deciding to let nature try her hand in the case. Life obtained at a real but minimum risk and an equally real risk of sure death are the two questions involved in a prompt operation and an expectant treatment. This is a point which, if well taken, changes a conservative into a radical on any question, and we will be surprised if many a medical man, as the number of reported cases of appendicial carcinoma increases

to greater proportions, does not leave the ranks of the expectant ones and proceed to prompt and thorough measures.

No ice-bag and no sedative treatment, nor even rest in bed, can either retard or destroy the carcinoma when once present in the appendix. And though cases of simple appendicitis have undoubtedly recovered and lived whole lives without a recurrence, no one, we now know, can tell whether the case is one of simple appendicitis or carcinoma. If the one, it may recover without operation; if the latter, the patient will die unless operated upon. And the only way to ascertain which she will do is to open and remove the growth if there, and the appendix, whether a carcinoma be evident to the eye or not. The duty to the patient ranks in advance of the fear of the result, and if left to the patient's own decision, the facts being fairly presented, the abdomen will be opened. Provided now an operation has been decided upon, and either upon the operating-table or later in the laboratory a malignant condition of the appendix be found, what shall be our course of procedure, even if the abdomen shall have already been closed before the growth is discovered? This question can only be settled with regard to the extent of involvement, the presence of metastases, or the infiltration of surrounding tissues. The abdomen should, at any rate, again be opened, and if the growth be microscopical, or even macroscopically evident, and yet have not, as far as can be ascertained, been transmitted beyond the appendicular walls, we believe the proper procedure to be the removal of the appendix only. Warren,[23] in a similar case (sarcoma of the appendix), extirpated the cæcum and a portion of the bowel on each side of the latter. The treatment is radical, and errs, if at all, in rendering the operative procedure more grave and extensive. Here, however, we must consider, in conjunction with the gravity of the surgical measures, the prognosis as it stands without such procedures. If the simple removal of the appendix with a growth which, to the best of our knowledge, involves only its own structures, presents a fair probability that the latter may never recur, then our duty is plain. If, on the other hand, a greater degree of safety is assured by a more extensive oper-

ation, a simple appendectomy is not to be considered. As yet we have neither statistics nor experience to help us in our decision, and the writers can only say that in such a case as that reported in this paper the less serious of the two procedures would seem to them to be indicated in the light of their views as to the pathology of the malignancy of the appendix. A new question is at hand immediately the bowel becomes involved or as soon as adhesions, adenitis, and peritonitis are observed.

Our own experience as well as that of others whom we have consulted covers absolutely no cases that have been diagnosed as such while still limited to the organ, or which have been observed for a sufficient time subsequent to the operation to warrant an opinion as to the certainty of cure or recurrence. If the growth were as small when removed as in the present instances, it would require considerable time for it to recur in such force as to give decided symptoms, especially as the bowel seems pre-eminently a favorable site for early operation upon carcinomatous growths. If our argument holds good, however, in regard to the sequence of causation of the tumor, we see no reason why, if removed while still limited to the appendix, the growth should ever recur. Where the growth is microscopical in the appendix, an extension would probably also be microscopical for some time. But it is equally true that the smaller the growth—and therefore the younger—the less likelihood there is of an extension having taken place, if we judge from the general rule followed by carcinomata; and the smaller the area involved the less likely the prompt recurrence if seasonably removed. We find by inquiry many opinions that differ on the point, however, and some distinguished authorities speak of the prognosis as certainly bad. Only time will tell. Of course, with the growth of vascular adhesions, the presence of a peritonitis, of a perforation, or of an extension directly to adjacent or contiguous structures, the prognosis assumes a character that is as certain as it is grave.

Up to the present time the whole subject is a new one, but it promises not only to throw light upon the well-trodden though

dim path of carcinoma, research, but to revolutionize the treatment and prognosis of appendicitis, provided only that the systematic examination of all diseased appendices causes an increase in the number of similar cases proportionate with that of the past semi-decade. Hurdon's case, as has been noted, is "in good health" in the beginning of the fourth year after operation.

The case first considered in the paper also has had an absolute recovery, as far as can be known at the present time, now eighteen months from the time of her operation. She has gained in weight, is absolutely free from lumbar and abdominal pain, and, except for the remembrance of the many dreary months of suffering, seems only the stronger and more active for all she has endured. The outcome of her case should definitely establish not only the prognosis but the treatment, at least, in similar cases, and we shall consider it both a privilege and a duty to publish the result at a later date.

Bibliography.

1. A. O. J. Kelly. University Medical Magazine, May, 1900.

2. E. Hurdon. Johns Hopkins Bulletin, July–August, 1900.

3. Letulle and Weinberg. Bulletin de la Soc. Anatomique de Paris, November, 1897.

4. H. D. Rolleston. Lancet, July 7, 1900.

5. Mosse and Daunic. Bulletin de la Soc. Anatomique de Paris, November, 1897.

6. J. H. Wright. Boston Medical and Surgical Journal, February 17, 1898.

7. Leichtenstern. Verengerungen, Verschliessungen und Lageveränderungen, des Darms; von Ziemssen's Handbuch der speciellen Pathologie und Therapie, 1878, vii. 2.

8. Nothnagel, Die Erkrankung des Darms und des Peritoneums. Nothnagel's Specielle Pathologie und Therapie.

9. Maydl. Ueber die Darmkrebs, Wien, 1888.

10. J. R. Goffe. Medical Record, July 6, 1901.

11. T. R. C. Whipham. Lancet, February 2, 1901.

12. H. Gilford. Lancet, July 29, 1893.

13. Lafforgue. Thèse de Lyon, 1893. Des tumeurs primitives de l'appendice vermiculare.

14. A. Beger. Ein Fall Krebs des Wurmfortsatzes. Berliner klinische Wochenschrift, 1882, xix. 616.

15. Ziemann. Bibliothek der medicin. Wissenschaft, von Drasche, iii. 49. Merling Journal de l'Experience, 1838 (quoted by Lafforgue).

16. Rokitansky. Ueber gallertkrebsige Erkrankung des Wurmfortsatzes mit Erweiterung desselben. Medicinische Jahrbucher, 1867, xiii. 179.

17. Prus. Thèse de Croizet (quoted hy Lafforgue).

18. Draper. Colloid Cancer of the Vermiform Appendix. Boston Medical and Surgical Journal, 1884, xv. 131.

19. Cancer of the Vermiform Appendix. Annals of Surgery, 1896, xxiii. 186.

20. Cullen. Primary Adenocarcinoma of the Appendix. Meeting of the Johns Hopkins Medical Society, February 6, 1899.

21. Monks. Excision of the Cæcum for Cancer. Boston Medical and Surgical Journal, 1899, cxl. 210.

22. A. O. J. Kelly, in Pathology of Appendicitis, by John B. Deaver.

23. Warren. Boston Medical and Surgical Journal, February 24, 1898.

24. Bierhoff. Beiträge zu den Krankheiten des Wurmförmigen Anhanges. Verhandlung des phys.-med. Gesellschaft in Wurzburg, 1859, ix. 123.

25. Kolaczek. Ein Adenom Destruens des Blinddarms. Archiv für klinische Chirurgie, 1875, xviii. 366.

DISCUSSION.

Dr. A. W. Elting, of Albany.

The subject of carcinoma of the appendix has interested me considerably during the past two or three years, my interest having been aroused by a remarkable case. The patient was eighty years old, and died from chronic pulmonary tuberculosis and general arterial sclerosis. At the time of autopsy a rather peculiar tumor about the size of an egg presented in the region of the appendix. It had produced a perforation of the appendix, and presented a lot of gluey material. A very careful examination of the rest of the body failed to reveal any other focus of malignant disease. A careful examination, however, of the mass itself showed it to be a pure carcinoma of the appendix. In looking up the literature of the subject since 1837 I found a number of cases reported, several in 1868, by Rokitanski, but on investigating more fully I found that the earlier cases seemed to have been of a different type. The relationship of chronic obliterative appendicitis with epithelioma and carcinoma has been brought more prominently before the minds of the pathologists within the last few years. My second case was that of a woman, aged forty years, who had had appendicitis eight or ten years before. At the time of the operation she presented the clinical appearance of chronic pelvic inflammatory disease. In the course of the operation the appendix was removed, and subsequent microscopic examination proved it to be a completely obliterated appendix with a small induration about the middle. This was later found to be an epithelioma, and the tumor aroused a good deal of interest in dissection. I do not feel prepared to make any positive statement about the tumor, but interesting results have lately followed investigations of chronic obliterative appendicitis. It has been associated with carcinoma of the appendix in several cases, one being in a child, twelve years old. The association of chronic disease of the appendix with primary carcinoma seems to be fairly well established and equally well demonstrated. Thus far it has surprised pathologists that primary carcinoma does not occur more frequently in the appendix. The relationship in the case of the gall-bladder would lead us to suppose that carcinoma of the appendix would be more frequent, and if the examination of all appendices was more carefully carried out, and examinations were made from several sections of each appendix, more primary carcinoma would certainly be discovered.

Dr. Robert F. Weir, of New York City.

I simply wish to report one case. In the early days of the removal of the appendix—that is to say, about 1892—I came across a mass in the appendix which the pathologist of the New York Hospital said was carcinoma. There was nothing else that attracted attention, and the patient remained perfectly well for three years, without any further involvement.

Dr. A. G. Gerster, of New York City.

From the very large amount of appendicial material at hand at the Mt. Sinai Hospital, collected during the past six years, averaging about 1200 cases, carcinoma of the appendix occurred but twice, and those two cases were within the last six or seven months. All the specimens were examined by the pathologist, and, had others been present, they could hardly have escaped the attention of the operator, the assistant, and the pathologist. Even if we accept the statement of Dr. Elting, we may add that, after all, new-growths of the appendix cannot be so very frequent, otherwise the gross development of the tumor would be met with more than it is now. The new-growths of the appendix, on account of their histological character, do not produce any pain or any symptoms until they get very large, and then it is due to their encroachment upon the lumen of the organ. When there is any interference with a discharge of the contents of the appendix, symptoms are noticed which are those of ordinary appendicitis. The condition must be a very rare one, as appendices removed at operations are nearly always carefully examined, while the number of carcinomata found are very few.

Dr. R. Matas, of New Orleans.

In the course of my teaching as demonstrator of anatomy, from 1885 to 1895, covering about 1000 subjects, I investigated, with my assistants, the condition of the appendix quite carefully, but never encountered a carcinomatous appendix. We made a point of examining them thoroughly, and I remember distinctly that we did not find any. There were some cases where the appendix was not examined, on account of decomposition, but outside of these neither carcinoma nor any other neoplasm was discovered.

Dr. Harte. I have been very much interested in this discussion, and I congratulate Dr. Elting on his very close observation of these interesting conditions. I think the sooner our hospitals are supplied with accurate, close observers in their pathological laboratories, cancer of the appendix will be found to be much more common than it is now regarded, and it is only by placing a number of the sections under the field of a microscope and studying them carefully that these conditions can be detected. The proof of this seems to be that within the last few years a large percentage of the recorded cases have been discovered, and nothing can be determined by simply cutting through the appendix and making a rough examination, as is usually done. What is found in the dissecting-rooms or in the ordinary post-mortem really throws little or no light whatever on the frequency or rarity of these conditions, and I feel that as soon as these specimens are more carefully and scientifically studied, our knowledge of them will become very much more perfect.

ABDOMINAL HYSTERECTOMY.

By JOHN B. DEAVER, M.D.,
PHILADELPHIA.

In discussing the subject of abdominal hysterectomy I desire first to present a short history of the operation, show the advantages it possesses over the vaginal operation, its safety over the operation of myomectomy, and why supravaginal amputation is preferable to total extirpation, except in malignant diseases, septic infections, and other exceptional instances.

To even mention the men who have given their work to the development of this procedure would be to enumerate a long list of the names of the most eminent surgeons of the past and present. The first to open the abdomen with the deliberate intention of removing the uterus were Drs. Burnham and Kimball, both of Lowell, Mass. These men, in 1855, within a month, each removed a fibroid uterus, with happy results. The method of treating the pedicle they used was that with which they were already familiar in the removal of ovarian cysts. After ligating the broad ligaments, the uterus, with its peritoneal covering, was transfixed by double silk ligatures which were tied on either side. The ligatures were left long and brought out at the lower angle of the wound. The stump was dropped, a glass drainage-tube inserted, and the wound closed. Both of these patients made good recoveries.

Kimball attempted this operation twice afterward, as did some other adventurous spirits, but with uniformly fatal results.

The next operator to attempt the operation of supravaginal amputation was, according to Pozzi, Koeberle, and to him and to Pean, both Parisian surgeons, belongs the credit of a great

improvement in the technique. They used a clamp, or metal wire loop around the pedicle, and fastened the stump in the lower angle of the abdominal wound. Koeberle is said to have invented the serre-nœud that has been in use ever since, and his method has received the indorsement of many eminent surgeons.

There was, however, a constant desire on the part of many surgeons to devise an intraperitoneal method of treatment of the stump from the incentive given them by the success of the intraperitoneal treatment of the pedicle of ovarian cysts. Various methods to accomplish this result were tried, but none were brilliant enough in their results to warrant a repetition. Carl Schroeder devised the first method of intraperitoneal treatment of the stump that remained in vogue for any considerable time. He sought to control hemorrhage by means of buried sutures of catgut instead of a ligature. His success was remarkable, but his death-rate was very high on account of the sutures not being sufficient to control the hemorrhage.

Martin, of Berlin, modified this method, and, by the use of a temporary elastic ligature around the stump and drainage by a rubber tube extending from the vagina into Douglas' cul-de-sac, succeeded in reducing the mortality of the operation to 22 per cent.

Zweifel abandoned the elastic ligature and substituted a continuous chain of linked ligatures down the broad ligament on either side and across the uterus. This operation embraced the wedge-shaped excision of the uterus and suturing the peritoneal edges. But his sutures pierced both peritoneum and uterus, and so allowed the escape of the oozing from the stump into the peritoneal cavity, and consequently many cases of sepsis followed. However, in 1899, he was able to report a series of 22 successful cases operated upon by this method.

In 1878 Freund performed the first operation that sought to shut off the stump from the general peritoneal cavity. He ligated the broad ligament with three sutures, the first around the ovarian artery, the second the round ligament, and the third the rest of the broad ligament, penetrating into the vagina. He cut

directly across the uterus, and then, by traction on the stump from the vagina, caused the peritoneum of the bladder and the posterior wall of Douglas' pouch to be approximated; these he united by a continuous suture.

Goffe and Dudley, in 1888, first covered the stump by peritoneal flaps cut from the uterus. They, however, depended upon a strangulating ligature to control hemorrhage. The suppuration and oozing, which almost always took place beneath the flaps, they ingeniously drained through the cervix. They called their operation extraperitoneal intrapelvic hysterectomy.

Milton, of Cairo, Egypt, first ligated the uterine artery in the broad ligament. In the *Lancet* of November, 1890, Milton reports three cases, all successful, in which he tied the uterine artery in the broad ligament and covered the stump with peritoneal flaps, making an operation ideal and complete without suppuration or sloughing.

Dr. Byford, after controlling hemorrhage, cut through the vaginal vault and turned the stump down and united the vagina over it, a very ingenious plan, but not one that received much commendation.

About this time the European operators advanced the claim that not in any form of amputation, but in total extirpation, lay the future of hysterectomy. The technique of the European operators, notably that of Freund, included two steps, first, amputation, and then removal of the cervix. This method was practised in this country and improved by Polk, King, Edebohls, and others, who, instead of making two distinct steps, removed tumor, uterus, and cervix *en masse* by cutting into the vagina around the cervix and treating the traumatic tissue as in vaginal hysterectomy.

The outline that I have given you of the development of abdominal hysterectomy is far from complete, and I have left out for the sake of brevity the names of many men whose work was of the utmost value in placing this operation upon a safe scientific basis. However, I have tried to trace hurriedly the important epochs in the development of the operation from a rash experiment to a scientific valuable operation.

The methods of abdominal hysterectomy in their essential principles can be divided into—

1. Supravaginal amputation.
   (*a*) With extraperitoneal treatment of the stump.
   (*b*) With intrapelvic extraperitoneal treatment of the stump.
2. Extirpation.

The various methods of abdominal hysterectomy have their mission in special instances, and I will endeavor to place the proper value to each, if possible, and incidentally introduce a few remarks upon a modification of the technique of supravaginal amputation whereby it is considerably simplified.

The instances where myomectomy is specially indicated are so uncommon that I do not believe that the added risk is justifiable in the average run of cases, and as myomectomy is indicated in isolated cases, pediculated fibroids, or with fibroids located in the broad ligament alone, it should be confined to these. In cases of subperitoneal fibroids in a woman of child-bearing age, or in the case of a single pedunculated fibroid, myomectomy may be the operation of choice, but in the majority of cases a supravaginal amputation, if done as high as possible, with the preservation of one or both ovaries, is the best operation. In many cases I have been able by this method to preserve every function except child-bearing. Where there is any question as to the propriety of removing the uterus on account of permitting questionable tissue to remain in the uterine walls, then hysterectomy by supravaginal amputation should be at once instituted.

That supravaginal amputation is the ideal operation, except in the presence of malignant disease of the uterus, I am firmly convinced, because it removes the disease without disturbing the function or normal relation of the vagina; again, it is not so likely to be followed by a hernia or prolapse of the pelvic contents as after a complete hysterectomy, and there are fewer cases of cystitis or urinary sequelæ after supravaginal amputation.

Some operators prefer a combined abdominal and vaginal

hysterectomy in cancer, to avoid contamination of the peritoneal cavity, but with the proper disposition of gauze this method is unnecessary.

The advantages which the abdominal route possesses over the vaginal are so numerous that a comparison between the two is scarcely possible. The increased space for necessary manipulation, the greater security against hemorrhage, the ability to thoroughly expose the vessels, to keep the field of operation constantly in view by the Trendelenburg position and gauze packing, to keep the intestines out of the way of injury, and, most important, the ability to better avoid infection, unquestionably makes this the avenue of election to perform hysterectomy.

In abdominal hysterectomy for carcinoma of the uterus we are able to keep much further away from the tissues which are most likely to be invaded, a larger portion of the broad ligament may be excised for greater security, and any glandular enlargement noted and removed than is possible by the vaginal operation.

The ever-present danger of injury to the ureters is not so likely to occur in the abdominal route on account of the better exposure of the structures, which are always in view and can therefore be more easily safeguarded. If an injury does occur to the ureters, it will be recognized and an immediate repair made, which can be much better done in the abdomen than through the vagina, and without running the same risk of contaminating the peritoneal cavity. The introduction of catheters or bougies into the ureters makes any pelvic operation safer. The possibility of infection always plays an important rôle in any abdominal operation, and the chances for infection are enhanced by the vaginal route, for the simple reason that we are working in a pathological field. While a normal vagina is possibly sterile, one the seat of disease is certainly not so.

The opportunity to guard against primary as well as secondary hemorrhage in abdominal hysterectomy is within the control of the operator, if the precaution is observed to include sufficient tissue within the grasp of the ligature, and to arrest all bleeding points in the divided cervix or broad ligament,

prior to making the toilet of the peritoneum. I have found that even the slightest bleeding may be responsible for the continuance of shock after operation or the inciting of a peritonitis. I can recall one instance where the patient presented the evidence of a commencing peritonitis, and at the same time had a subnormal temperature, in whom I discovered a small bleeding point with slight oozing, which disappeared after the bleeding point had been secured.

The complete removal of the uterus above the pubis is, in my mind, only indicated in those cases where the extension of the disease involves the entire organ; while carcinoma of the uterus always calls for the removal of the uterus and cervix. The non-malignant conditions calling for total extirpation of the uterus are, in my judgment, a fibroid involving the posterior segment of the cervix low down, making a supravaginal amputation impossible, and in septic infection of the uterus either postpuerperal, or from other causes.

The modification advocated by Doyen has its advantages in a few special instances, where there is a particular difficulty in mapping out the upper limit of the vagina in attempting the complete removal of the uterus. To advocate this modification in all complete hysterectomies is an unnecessary addition to the technique, and employed only by those unfamiliar with the anatomy of the pelvis and its contents.

In certain cases of fibroid, and particularly in persons unable to withstand a prolonged operative procedure, a method devised by Kelly has many advantages in that it permits of a supravaginal amputation to be performed by practically one sweep of the knife. An incision is carried down one broad ligament, dividing the ovarian and uterine arteries, which are caught with pressure forceps, the peritoneum over the anterior surface of the uterus divided and pushed down, the cervix exposed and cut across, and the extirpation completed by the division of the broad ligament on the opposite side and the vessels secured by clamps. The operation is completed in the usual manner. Ligatures are applied to all the vessels and the field of operation made extraperitoneal.

The methods of abdominal hysterectomy have been modified to a greater or less extent by every operator, but in their essential characteristics all the operations now done fall under one or another of the heads that I have given. The best results for our patients will be attained by a careful study of the conditions for which the operation is done, with a view to deciding what operation is most suitable for the individual case. The serre-nœud operation is one that is perhaps least often done to-day, but as long as it is advocated by so eminent an authority as Dr. Joseph Price, and he is able to report a series of 114 consecutive recoveries in cases operated upon by this method, the operation cannot be said to have sunk into desuetude.

We are all guided more in the choice of an operation by our personal experience and that of others than by any mere theories. My experience in this subject has been perhaps great enough to justify my outlining some of the pathological conditions for which hysterectomy is called, and the method that has proved most serviceable to me in the various cases, without my appearing pedantic.

No matter how small and circumscribed the fibroid tumor may be, there are certain complications that may occur in any case that cannot be safely treated through the vagina; for instance, pyosalpinx with visceral adhesions. In many cases of pyosalpinx or salpingitis the trouble is latent and causes no symptoms, but adhesions consequent upon an active salpingitis may be the cause of most distressing symptoms. These symptoms will not be relieved by a vaginal hysterectomy, and for their eradication an abdominal hysterectomy is not only indicated, but imperative. An ovarian or intraligamentary cyst often coexists with a fibroid, and can be safely treated in no other way than by abdominal section.

In some cases of intraligamentary cyst hysterectomy is indicated, either to avoid exposed surfaces which will invite adhesions, or to prevent hemorrhage from the surface of the uterus.

A carcinoma involving either the cervix or the fundus, unless seen very early, calls for an abdominal hysterectomy as

the best operation, owing to the extensive lymphatic supply of the uterus.

The practice of removal of fibromyomas per vaginam, either piecemeal or in their entirety, with the exception of pediculated submucous fibroids of small size, I heartily disapprove of.

It is, I believe, the opinion of some surgeons that the presence of blood in the peritoneal cavity is a matter of small moment, and not at all harmful; to this I cannot subscribe, and would enter a strong protest against such teaching. We must recall the fact that the peritoneum which has been the subject of traumatism, as is the case after any operative procedure, is less resistant to secondary inflammatory action, and often rebels at the presence of any foreign matter; in this instance the sanguineous fluid must be so considered. In another part of this paper I have cited an instance where this occurred, and no doubt many of you have had the same experience.

There is no question that the origin of many cases of peritonitis are brought about in this manner, and particularly where we can exclude infection from other causes. This will also be proven if in all cases of death after operation a post-mortem examination is made, so as to demonstrate the cause of death.

A septic infection of the uterus associated with pyosalpinx or a postpuerperal infection calls for a complete hysterectomy.

The results of hysterectomy in postpuerperal infection are more serious than extirpation for other infectious conditions. The constitutional disturbance must be the determining factor whether a hysterectomy shall be done or not; unfortunately, I regret to say that any operation is but too often contra-indicated for the above reason.

The remote effects of total extirpation of the uterus are just beginning to attract our attention. One, a most obstinate and distressing complication, is mechanical irritation of the bladder, due to a prolapse of the base of the organ coincident with the formation of a cystocele, the latter occurring as a result of the removal of the support to the vault of the vagina by reason of the taking out of the cervix, and the obliteration of the round

and broad ligaments as a factor in assisting to retain the vault in its normal position.

One of the strongest drawbacks to abdominal surgery, and to operations the results of intra-abdominal inflammation, is the formation of adhesions. It has been the unceasing effort of all surgeons to devise some means of prevention whereby this happy result might be obtained. In the effort to prevent the formation of adhesions it has been the practice of late years to avoid leaving denuded surfaces by sliding over flaps of peritoneum; but, notwithstanding these efforts, it has been the experience of all surgeons that the result of any operative measure might be destroyed by the occurrence of post-operative adhesions, of a greater or less extent, sometimes giving the patient more discomfort than the original lesion, and even endangering their lives by an acute intestinal obstruction which calls for, at times, a very much more serious operative measure than the primary lesion.

Some months ago a prominent manufacturer of antiseptic dressings supplied me with a sterile absorbable animal membrane, which was suggested to him by Dr. Charles H. Cargyle, of Bentonville, Arkansas, the purpose of which was to avoid the formation of postoperative adhesion by placing it over the denuded surfaces. I have used this membrane in a considerable number of cases, with a most happy result. The great difficulty, however, in the use of the animal membrane is to retain it in place. This has been overcome, I believe, by my assistant Dr. L. Brinkmann, who tacks the membrane in place after it has been applied, by suturing the corners and edges of the membrane at as many points as he finds necessary.

The animal membrane is also employed to prevent the formation of adhesions between the pedicle or stump of a tumor, or the remains of a Fallopian tube and contiguous structures after division, by either suturing it in place or tying it in position with a very fine piece of silk.

A very clever procedure suggested by Dr. Howard Kelly for the removal of extra-uterine masses which are densely adherent, and which call for a supravaginal amputation or complete

removal, is bisection of the uterus prior to the enucleation of the pelvic masses. In experienced hands this affords an excellent and safe means of disposing of the pathological condition without much danger to the surrounding viscera to which it may be attached.

The enucleation of densely adherent pus tubes, ovarian and intraligamentary growths or cysts, as the case may be, can be easily freed from below upward after removal of the uterus. The method is to expose the fundus of the uterus, evacuating any cystic, hemorrhagic, or purulent collections that may be present, the peritoneal cavity having been previously protected with gauze packing. The cornua of the uterus are grasped by long pressure forceps and the organ divided in its long axis from before backward, the cut surfaces being held apart by the forceps on the cornua; an additional pair of pressure forceps are applied to the lowest angle of the uterine wound, including the anterior and posterior cut surfaces of one side of the bisected uterus. The pressure forceps of the same side at the cornua are removed and reapplied to the remaining half of the uterus at the lower angle; the cervix is cut across on one side, the bisected body is gently drawn upward, and the uterine artery exposed, ligatured, and cut away; the round ligament is brought into view by traction upon the pressure forceps and the round ligament, tube, and ovarian vessels grasped by a pair of forceps, and the half of the uterus cut away. The same process is carried out upon the remaining half of the organ.

The pelvic masses are now comparatively easy to remove, making the dissection from below upward.

The operation preferred by the author is done after the following manner: The abdominal cavity is exposed by incision through either rectus muscle, the patient placed in the Trendelenburg position, and the intestines walled back with gauze pads from the field of operation. A continuous incision, semilunar in shape, with the convexity directed downward and corresponding to the line of reflection of the peritoneum from the uterus on to the summit of the bladder, is carried through the peritoneum of the anterior face of the broad ligament and

uterus. The peritoneal flap is displaced downward, using pressure through the medium of a piece of gauze to make the dissection.

A single ligature is applied upon either side to control the vessels. Within the grasp of the ligature are the ovarian and uterine arteries and veins, and the round ligament. If an ovary is left behind, the ligature is applied to the uterine side, and if not, to the pelvic side. The broad ligament is divided close to the body of the uterus, which in turn is amputated by a V-shaped incision through the cervix.

The cut edges of the cervix are approximated by a continuous suture from side to side, the peritoneal flap sutured over the cervical stump, and stitched to the posterior surface of the cervix.

FATAL ACETONÆMIA FOLLOWING AN OPERATION FOR ACUTE APPENDICITIS.

By GEORGE EMERSON BREWER, M.D.,
NEW YORK.

The object of this communication is to report and place on record the history of a case of acute perforative appendicitis, which was apparently progressing favorably after operation, in which death probably resulted from an acute auto-intoxication of the type seen frequently in diabetics and described under the term acetonæmia. The condition is, in the writer's experience, absolutely unique, and he has been unable thus far to find any record in literature of its occurrence as a fatal surgical complication in non-diabetic cases.

S. S., aged twelve years, a school-boy, was admitted to the Roosevelt Hospital on April 29, 1901. There was nothing in the family history nor in the previous history of the patient which could have any bearing upon the pathological condition which is to be described. Previous to this illness he presented every evidence of the most robust health.

Two days before his admission, after a long and rather fatiguing military drill at his school, he was suddenly seized with an acute abdominal pain, which was more or less general at first, and was accompanied by nausea and vomiting. Later the pain became more severe, and was referred to the right inguinal region. There was a slight elevation of temperature and an increase in the pulse-rate. He was seen by Dr. Edson, his family physician, early in the evening, and on examination he found tenderness and muscular rigidity in the right lower quadrant of the abdomen. Appropriate treatment was prescribed, including an ice-bag to the inguinal region. The following day there was a very considerable improvement in all the symp-

toms; the temperature had fallen to 99.8° F., pulse to 90, and there was no pain.

He passed a comfortable day, but during the following night the pain returned, and on the morning of his admission to the hospital, as the temperature was 101° F., pulse 110, leucocytes 17,000, an immediate operation was advised. After the usual preparation, under chloroform anæsthesia, an incision was made over the region of the appendix and the abdominal cavity opened by the intermuscular method. Examination revealed the presence of a tumor composed of intestine, omentum, and the inflamed appendix glued together with plastic exudate, and situated in the iliac fossa near the anterior superior spinous process. After walling off the intestines with gauze pads, the adhesions were separated, and a perforated gangrenous appendix found in a small abscess cavity which contained about two drachms of foul-smelling pus. The appendix was removed, the cavity disinfected, two cigarette drains introduced, and the wound partly closed.

Duration of anæsthesia about twenty five minutes.

After his return to his room the temperature was found to be 103° F., pulse 120, and of good quality. As his general condition at that time seemed satisfactory, no stimulation was ordered. Considerable pain followed his recovery from the anæsthetic, which was relieved by one-eighth grain of morphine. There was no vomiting, and he was able to take and retain water by the mouth four hours after the operation. During the night he became restless and complained of more pain, but was again quieted by a small dose of codeine. The following morning he seemed bright, the temperature had fallen to 101° F. and the pulse to 88; he took and retained fluid food; later in the day there was a still further drop in the temperature. He complained of some distention; an enema was given, which resulted in a fairly large yellow movement.

The second night after operation was a comfortable one; his distention was relieved, gas passed freely by the rectum, and he slept about six hours. The following morning his temperature had fallen to normal, his pulse to 76; he seemed cheerful and happy and expressed himself as free from pain and hungry. The wound was dressed, and was found to be in a satisfactory condition. The abdomen was flat; there was no rigidity, and only slight tenderness in the wound area. Calomel and salts were administered; the bowels moved again, and much gas was expelled.

During the entire day his temperature remained normal and his pulse never rose above 80. He slept most of the afternoon and made no complaint. The urine, which before operation had been normal, to-day showed a slight trace of albumin and a few finely granular and hyaline casts; no sugar, pus, or blood.

The following night he slept quietly until shortly after midnight, when he suddenly awakened and, without any apparent cause, uttered a piercing shriek, which was so agonizing and expressive of terror that it not only greatly alarmed his nurse, but also his mother, who was sleeping in an adjoining room. He continued to scream for several seconds, looked wildly about, and apparently failed to recognize those around him. A few moments later he again fell asleep and rested quietly until the morning. The symptoms were at first attributed to a bad dream or nightmare. The following morning he was distinctly somnolent, and when aroused would cry out and appear for a moment very much frightened, but would be easily soothed by his mother, after which he would again fall into a quiet sleep. His temperature was 98.5° F., pulse 74; the abdomen was soft; there was no distention; the secretion of urine was free and of the same character as on the preceding day. He was seen by the writer at about eleven o'clock in the morning. He was then sleeping soundly, and appeared in every way normal. On waking him, he again uttered an agonizing cry and looked the picture of abject terror. His eyes wandered from one person to another without the slightest sign of recognition. He continued to scream with such vehemence that his cries were heard all over the building. All efforts to soothe him seemed unavailing; his terror was painful to witness, and the whole picture suggested unspeakable fright and the most acute mental suffering. These paroxysms would last from a few seconds to two or three minutes, and would be succeeded by a comparatively long interval of rest, during which he would apparently be sleeping quietly.

The pupils were symmetrical and reacted to light and accommodation. There was no evidence of cranial nerve palsy or irritation. There was no impairment of sensation or motion in any part of the body; the reflexes were apparently unaffected. His temperature and pulse remained normal, and there was nothing to indicate any gastro-intestinal irritation, pulmonary or cardiac disturbance. I immediately called my colleague, Dr. Blake, in consultation, and, after a thorough examination, he agreed with me that the wound conditions were satisfactory, and that there was no evidence of sepsis. He was unable,

however, to offer any explanation of the mental symptoms, and we both agreed that the opinion of an expert neurologist should be obtained as soon as possible. As the parents urged us to call upon anyone who could be of service to us, a consultation was quickly called, at which Dr. Edson, the family physician, Dr. Blake, Dr. Pearce Baily, and Dr. George L. Peabody were present. After carefully reviewing the history of the case from the beginning, and repeating the previous examinations, during which the child passed through several of the screaming paroxysms, the consensus of opinion as expressed was that the patient presented evidences of extreme cerebral irritation, the cause or causes of which could not at that time be discovered, as none of the gentlemen present had ever seen or heard of a similar case.

During or shortly after the consultation the writer noticed a peculiar sweetish, ethereal odor of the breath, which was verified by each one present. The nurse stated, in answer to inquiries, that she had noticed that peculiar odor ever since she came on duty at seven o'clock in the morning. The opinion was expressed that the odor was in all probability that of acetone, and indicated a condition of acetonæmia which might be a causative factor in the production of the symptoms. As none of those present at the consultation had ever observed symptoms due to acetonæmia in conditions other than diabetes, and as the symptoms of acetonæmia in diabetes were usually those of a rapidly deepening coma rather than delirium and cerebral irritability, no definite conclusions could be arrived at until more complete examination of the urine or blood could be made, and further observations of the symptoms and progress of the case. Meanwhile the symptoms were increasing in severity, the paroxysms occurring more frequently, the character of the delirium becoming more distressing, and the intervening sleep deeper and more resembling coma. At 6 P.M. the temperature was still normal; the pulse during sleep 80, but weaker; physical signs unchanged. An hour later the patient was seen in consultation by Dr. Evan Evans, who expressed very positively the belief that the symptoms were due to an acute auto-intoxication which is associated with the presence of acetone and diacetic acid in the blood. He gave an extremely grave prognosis, predicting death within twenty-four hours unless the symptoms were speedily relieved by free catharsis, diuresis, and the intravenous injection of a solution of chemically pure bicarbonate of sodium. He volunteered to make a thorough analysis of the urine and blood, which

he did immediately at the pathological laboratory of the College of Physicians and Surgeons.

The result of this analysis showed large quantities of both acetone and diacetic acid in the urine and blood.

The subsequent history of the case is as follows:

At 8 P.M. about 400 cubic centimetres of blood were withdrawn from the median cephalic vein of the left arm and sent to the laboratory for examination, after which he was given an infusion of about 1000 cubic centimetres of normal salt solution, to the last of which about fifteen grammes of chemically pure bicarbonate of sodium were added. The stomach was next washed and a large dose of calomel and Epsom salts introduced through the tube. After an hour's rest he was given a prolonged hot saline irrigation of the rectum by means of a Kemp tube. An hour later another dose of Epsom salts was administered with a stomach-tube, followed by a high enema of turpentine, glycerin, and soap-suds. As there had been no spontaneous urination for several hours, he was catheterized, and a moderate quantity of urine withdrawn having a very strong odor of acetone.

During this time the character of the symptoms underwent a change. The paroxysms of screaming were of shorter duration, and occurred less frequently; the intervening sleep was more profound, and he was less easily awakened by treatment; the pupils seemed more dilated; there was no change in the temperature, although the pulse increased somewhat in frequency and was evidently growing weaker. The circulation in the extremities was slower; the face seemed slightly cyanosed; the eyes expressionless. Shortly after midnight, as the bowels had not moved, and as it was thought that the intra-abdominal cigarette drains might be causing mechanical obstruction, the wound was dressed and the drains removed. It was then observed that the abdomen was somewhat distended. An hour later, as his condition seemed unchanged, he was given two ounces of castor oil and two minims of croton oil through the stomach-tube, and the hot saline rectal irrigation repeated. About 3 A.M., as no movement had occurred, he was given another high enema of turpentine and glycerin, without result.

Between four and five his condition began to change for the worse; the respiration became shallow and more rapid, the pulse was weaker, and the temperature rose rapidly to 103° F.; the paroxysms of acute delirium ceased, and he fell into a condition of progressively deepening coma. As there had been no movement from the bowels, as a

last resort, early in the morning, the cæcum was opened in the wound and the bowel freely irrigated, but without producing any change in the symptoms, which steadily progressed until eleven in the morning, when he died.

In the absence of an autopsy, which, under the circumstances, it was impossible to obtain, the only method of correctly interpreting these extraordinary symptoms and arriving at a correct diagnosis is by the method of exclusion. Briefly stated, we have to do in this case with a localized septic focus in the abdominal cavity, well protected by nature, and thoroughly removed by operation. Following its removal there was a rapid subsidence of all septic manifestation, evidenced by a progressive fall to the normal of the pulse and temperature, the disappearance of all pain, rigidity, and distention, free evacuation of the bowels, and a general and progressive improvement in the patient's appearance, behavior, and feelings. In the midst of this improvement, and unaccompanied by any evidence of either local or general sepsis, there suddenly occurred acute delirium, frightful hallucinations, a failure to appreciate his surroundings or recognize those about him, somnolence, coma, and death within thirty-two hours from the first untoward symptom.

The irritant which produced this extraordinary and rapidly fatal cerebral disturbance must have been a very powerful one, or one which was developed in large quantities during a very short period of time. Of the various causes which might give rise to such a train of symptoms, we must consider, first, traumatism; second, septic infection, local or general; third, the toxic action of drugs; fourth, auto-intoxication.

Traumatism can be absolutely excluded by the history. Of the septic processes which might act as a causative agent, we must consider acute meningitis or cerebritis, from middle-ear suppuration, frontal sinus, or ethmoidal disease; epidemic cerebro-spinal meningitis; or a metastatic process from the abdominal focus. The first three can be absolutely excluded by the history and result of local examinations, as well as by the fact of the acuteness of the onset, rapidity of progress, and

early termination. These facts, together with the complete absence of fever or general illness, would serve also to exclude epidemic cerebro-spinal meningitis. Septic meningitis, in the writer's opinion, can be absolutely excluded by the absence of prodromal headache, restlessness, intolerance of light and sound, from the exceedingly sudden development of the gravest mental disturbances without the slightest premonitory sign, from the absence of fever, and the presence throughout of a slow, calm, even pulse, which remained at a point generally below 80 until a few hours before his death.

It is impossible to conceive of a septic meningitis of such virulence, that it ran its course from the first sign to a fatal coma in thirty-two hours, to exist without fever. Moreover, a metastasis of such virulence would not be likely to occur after the complete removal of the original focus and after three days of rapid improvement in all the symptoms. That we may have structural changes in the meninges accompanied by exudate, as in the other serous membranes of the body, due wholly to an intense toxæmia from some remote septic focus, will not be questioned. In fact, one of the consultants suggested this as a possible explanation of the symptoms in this case. The writer believes, however, that this can be excluded, from the fact that the symptoms did not appear during the stage of the disease when the toxæmia was necessarily greatest, before the removal of the septic focus, but did appear after the disappearance of all indications of toxæmia, as evidenced by a disappearance of the local inflammatory conditions and a return to the normal of the temperature and pulse. Moreover, one would not expect a toxæmia of that virulence to manifest itself by cerebral symptoms alone, with a complete absence of the other ordinary indications of such a condition.

The toxic action of drugs can be positively excluded in this case, as only one-eighth of a grain of morphine, a very small amount of codeine, Epsom salts, and calomel had been administered.

Of the auto-intoxications, three varieties must be considered —ptomain poisoning, uræmia, and acetonæmia.

In ptomain poisoning the symptoms are due to the local and general effect of toxic substances which are generated in the gastro-intestinal tract by various fermentative and putrefactive processes. The symptoms are similar to those produced by some powerful and poisonous alkaloid. There is acute prostration, with rapid, feeble pulse; cold perspiration and subnormal temperature, accompanied often by severe vomiting and purging. The symptoms appear suddenly, the progress of the disease is rapid, in the fatal cases death occurring often in a few hours. The absence of any symptoms of prostration or gastro-intestinal irritation, and the fact that the diet had been limited to milk, broths, and rice would serve to exclude this disease.

Uræmia can be excluded by the absence of any evidence of previous disease of the kidneys, and by the fact that up to within a few hours of death a full amount of urine was secreted containing a normal output of solids. Moreover, there was nothing whatever in the clinical picture to suggest uræmia.

If we are justified in excluding the above conditions, it is the writer's opinion that we must assume that the cause of death in this instance was the occurrence of that form of auto-intoxication described as acetonæmia.

That the term acetonæmia is a misleading one will be evident from the following brief *résumé* of the facts bearing upon our present knowledge of this condition.

Acetone is a colorless, limpid fluid, of a sweetish, ethereal odor, and has been known chemically for many years.

It was first discovered as a pathological constituent of the urine by Pettus, in 1857, who observed it in a case of diabetic coma. Kaulich afterward found it constantly present in varying quantities in all stages of the disease. Kussmaul, in 1874, described the symptoms of diabetic coma, but threw some doubt on the toxic action of acetone as a causative factor; and, later, Gerhardt and others demonstrated the constant association of diacetic acid and B. oxybutyric acid with acetone in the blood and urine. Without going further into the history of the subject, it may be stated that, under certain conditions of

the body metabolism, the most important of which, according to Herter, is an increased destruction of proteid matter, acetone appears in variable quantities in the blood and urine, and if present in large amount is associated with the presence of diacetic and B. oxybutyric acids, and possibly some other volatile fatty acids. This is the condition usually spoken of as acetonæmia, but it is better described by the term "acid intoxication" or excessive "acidosis."

This condition is often associated with grave cerebral disturbances, of which delirium and coma are prominent symptoms, and, if the intoxication is of greater intensity, death speedily results. At first the toxic agent was thought to be the acetone, but this was afterward proved by animal experiments to be harmless. Later, the diacetic and B. oxybutyric acids were held responsible for the symptoms; but later investigation has shown that the symptoms, to a large extent at least, depend upon an entirely different cause.

It has been recently demonstrated that the presence of these three substances in the blood results in a marked diminution in its normal alkalinity, upon which depends its ability to absorb carbon dioxide from the tissues, and that the symptom-complex in this condition is due rather to a rapid carbon dioxide poisoning of the tissues than to the toxic effect of any or all of these substances, although it is held by some authorities that the oxybutyric acid and the probably associated volatile fatty acids are in themselves to some extent toxic.

The three characteristic symptoms of this condition are a well-marked sweetish, ethereal odor of the breath, delirium, and a rapidly fatal coma. In the great majority of instances the stage of cerebral excitation is brief and often overlooked, the only symptom appearing to be a progressively deepening coma.

Other symptoms are occasionally observed, among which may be mentioned the "air hunger" described by Kussmaul, and evidenced by increased rapidity and depth of respirations, with a bright-red color of the mucous membranes and the skin, due to the presence of aerated blood in the veins from the

inability to absorb carbon dioxide from the tissues. R. T. Williamson, in the *Encyclopædia Medica*, describes an alcoholic type in which the stage of cerebral excitation is most marked, the patients becoming wildly delirious, and exhibiting evidences of fright strongly resembling delirium tremens. This type of the disease is perhaps more common in children, and has been described in the *Traité des Maladies de l'Enfants* by Graucher, Comby, and Marfan, in the following manner: "In other cases the child is seized by violent agitation, with groaning and unintelligible cries, inco-ordinate movements, and delirium, the coma manifesting itself only after the period of excitation has passed. The temperature is often subnormal."

Regarding the odor of the breath, the writer continues: "Many cases are signalized by a peculiar odor of the breath; a pungent or vinaceous odor or the odor of acetone itself, sometimes comparable to that of a pippin apple, sometimes to that of chloroform. It may be quite faint, appreciable only on leaning over the bed near the patient's mouth, or very marked, filling the whole room."

While this condition of acid intoxication was formerly thought to occur to a fatal degree only in diabetes, a sufficient number of cases have been reported to conclusively demonstrate that it can occur independently of that disease. Clinical and experimental researches have shown that it may occur in infectious fevers and general sepsis; in intestinal fermentation and putrefaction; in pregnancy with the presence of a dead fœtus; in brain lesions, in tabes, paresis, and melancholia, as a result of general anæsthesia from both ether and chloroform; after extirpation of the pancreas in animals; and under conditions of a changed diet, especially the complete elimination of carbohydrates from the food, and in starvation.

Seeking to establish the cause or causes of death in the so-called cases of "chronic chloroform intoxication" described by Casper, König, Volkmann, and others, Kast and Mester (*Zeitschrift für klinische Medicin*, Band xviii., p. 469), in 1891, undertook a series of observations upon the urine of patients after anæsthesia by chloroform, and found, among other sub-

stances indicating increased destruction of proteid matter, a condition of hyperacidity, the cause of which was not at that time determined. Later, Ernst Becker (*Deutsche medicinische Wochenschrift*, 1894, Band xviii., p. 409; *Virchow's Archives*, vol. cxl., p. 1), after observation of a large number of cases in which general anæsthesia was immediately followed by symptoms of acute acetonæmia in diabetes, systematically examined the urine of several hundred healthy individuals, before and after the administration of the various anæsthetics, with the result that in over 60 per cent. of his cases general anæsthesia was followed by a pathological amount of acetone in the urine; that the highest percentage occurred after chloroform narcosis, and that it was more frequently observed in children than adults. He reports one case in which the classical symptoms of acidosis, hallucinations, cries, stupor, coma, air hunger, cold extremities, Cheyne-Stokes respiration, etc., followed general anæsthesia, associated with marked acetonuria. The symptoms were alarming and lasted nineteen hours. The life of the patient was saved only by the persistent employment of artificial respiration and active stimulation. The urine was free from acetone before the anæsthetic, and at no time contained albumin or sugar.

In a series of observations undertaken at the Roosevelt Hospital by Dr. J. H. Blue, at the suggestion of the writer, the presence in the urine of a pathological amount of acetone occurred in seven out of thirty-three cases following anæsthesia. In five of these chloroform had been used, and in two ether. None of the cases were diabetic, and in none was there a reaction for acetone before the administration of the anæsthetic. In all the acetone appeared on the day following the operation. In two it was found on the second and third days, in the remaining five on the second. In six of the cases there were no symptoms which could be attributed to acidosis; in the seventh death occurred thirty-six hours after a gastro-enterostomy for carcinoma, with rather indefinite symptoms of so-called secondary shock.

While these observations by no means establish the fact that

a condition of true acid intoxication was present in seven of our thirty-three cases, as there was no proof that the urine contained either diacetic or B. oxybutyric acid, they show at least that there was in these cases an increased destruction of proteid matter, a condition which may be regarded as the first step in a pathological process which, if continued, would probably lead to a condition of acidosis sufficient to give rise to symptoms.

I think most surgeons have had the experience of seeing certain patients die on the second or third day after comparatively simple operations, exhibiting indefinite toxæmic symptoms which occur rather too early to be attributed to sepsis and rather too late to be accounted for by shock—a condition which is often described by the indefinite and meaningless phrase "secondary shock." It may be that later investigation will show this condition of acid intoxication to be a factor in some of these cases.

In conclusion, the writer desires to say that it is his intention to continue these investigations, and if any facts are obtained bearing upon surgical acetonæmia which are worthy of record, to present them at a subsequent meeting of the Association. This communication he hopes will simply be regarded as a preliminary report.

ADDENDUM.

Test for Acetone. Place about twenty cubic centimetres of the urine in a small glass retort, heat over an alcohol flame, and condense vapor in a cold test-tube; then add a small amount of potassium hydrate to render reaction alkaline, after which add four or five drops of Gram's solution of idiopotassic iodide, and heat gently, and yellow crystals will form in the tube.

Test for Diacetic Acid. Fifteen cubic centimetres of urine should be treated with a dilute solution of ferric chloride (not too acid) as long as a precipitate forms. This should be removed by filtration, and the filtrate again treated with the ferric chloride. A claret-red color indicates the presence of diacetic acid. To verify this, a second fifteen cubic centimetres of urine should be boiled and tested in the same manner. This should give a negative result, as the diacetic acid is decomposed by boiling.

Test for B. oxybutyric Acid. This requires the resources of a well-equipped laboratory. In the presence of acetone and diacetic acid, the presence also of B. oxybutyric acid may be assumed if the polariscope shows a strong rotation to the left of the plane of polarized light, in the absence of levulose and the glycuronates.

DISCUSSION.

Dr. John B. Deaver, of Philadelphia.

I should like to know if he took out the appendix. I think it is a plain case of sepsis. The case was seen early, but operation was deferred until you could not tide him over. The diagnosis was sepsis, without a doubt; nothing less nor nothing more. In reference to the examinations of the urine, I certainly would not have confined myself to these. In the majority of cases of sepsis there is a moderate irritability of the nervous system, and in the pronounced cases you will get albumin and casts in the urine. I am surprised that Dr. Brewer did not get a leucocyte count. I should like to know if he did this. The weak point in the whole case was that he did not have a post-mortem.

Dr. Brewer. I want to agree absolutely with all that Dr. Deaver has said in reference to the advantages of early operation; but we do not see all of these cases early. As to a leucocyte count, it was made at the time of the operation, and the number of white cells was found to be 17,000. A previous count gave only 12,000. The case under discussion is one of a differential diagnosis between sepsis and autointoxication. I do not believe that every case of death after abdominal operation is necessarily due to sepsis, as there are a number of other well-known conditions which cause it. The fact that there was albumin in the urine, and that casts were found, by no means proves that the termination of the case was due to sepsis, for that degree of kidney irritation could easily be due to the anæsthetic used. Acetonæmia was formerly supposed to be associated only with diabetes. We now know that it is associated with many other conditions, among which we may mention infectious diseases, cerebral troubles, paresis, melancholia, tabes, and, experimentally, after removal of the pancreas in animals, in pregnancy with a dead fœtus, and in starvation. It is absurd, in my opinion, to say that death in this case was due to sepsis, when at the time these grave symptoms developed there was not a sign of progressive sepsis, but, on the other hand, every indication pointed to a progressive recovery from the previous septic disturbance, as evidenced by a progressive fall to a normal of the temperature, the pulse, and respiration, by absolute freedom from local pain, rigidity, and tenderness. Of course, sepsis may occur from a local focus in the abdomen, which may give rise to grave cerebral symptoms, and in my

paper I mention this as a possibility. I think, however, that this can be positively excluded for the reasons given above, and also for the reason that the symptoms developed suddenly and progressed rapidly to a fatal termination in thirty-two hours. The clinical picture was an extraordinary one, and was one of acute cerebral irritation without symptoms pointing to any other disturbance. An irritant which produced such symptoms and led to a fatal termination in thirty-two hours must have been one which developed with great rapidity—far greater, in fact, than could have been developed as the result of sepsis. We must not forget that in this case the chief symptoms were a strong odor of acetone on the breath and a large amount of acetone and diacetic acid both in the blood and urine, associated with the wildest delirium and a rapidly fatal coma—symptoms which all who are familiar with the condition of acidosis will recognize at once to be absolutely characteristic of that condition. I do not see how any other conclusion can be arrived at. I wish, however, again to agree with Dr. Deaver in all that he says regarding the treatment of appendicitis, which, however, has little or no bearing on the question under discussion; in fact, I agree with Dr. Deaver in everything but his conclusions.

TWO CASES OF EXOPHTHALMIC GOITRE TREATED BY OPERATION.

By EMMET RIXFORD, M.D.,
SAN FRANCISCO.

In reporting the two following cases of exophthalmic goitre it is not proposed to draw from them any very broad generalizations, but to bring forward whatever of interest they possess in the hope that in a subject where the indications for surgical interference are still indefinite even such isolated observations may be of value. Individually, the cases present some unusual features worthy of note, which shall be the writer's excuse for reporting them in detail: the one, the development of severe Basedow symptoms after a course of thyroid extract, a rapid development of a cyst in the remaining half of the gland after a unilateral thyroidectomy, with recurrence of the nervous symptoms, transitory myxœdema after a second operation, with eventual relief; the other presenting universal non-pitting œdema unaffected by a short administration of thyroid extract, by which, however, the nervous symptoms were markedly increased, the whole clinical complex being altered and relieved by enucleation of a large encapsulated thyroid adenoma. In both cases the symptoms of Graves' disease were secondary to the appearance of the goitre.

If a word may be said of the operative treatment of exophthalmic goitre in general, and the indications for its employment, the following is offered as representing the consensus of opinion of the more broadly conservative surgeons at the present time, viz.: that, with the obvious exception of the few cases in which the indications for operation are absolute (as when the tumor produces dangerous compression of the trachea), patients suffering from exophthalmic goitre should be subjected to

operation only after reasonable trial of medical treatment has been made and failed. However, as knowledge of the relation of the goitre to the symptoms increases and the technique of operation is developed, the limits of usefulness of operation will be better determined, and it is probable that a larger and larger proportion of cases will be successfully treated surgically. At least a review of the literature of the subject of the last few years seems to warrant that expectation. The reason for this conservative position of surgery at the present time is, in addition to recognition of the real value of medical treatment, in which should be included mental and bodily rest, the universal experience that operation on patients suffering with exophthalmic goitre is attended with grave danger. Furthermore, it has been shown that this danger is especially great in acute cases, and somewhat in proportion to the severity of the nervous symptoms. It would seem, then, that operation is pretty definitely contraindicated in severely acute cases and in acute exacerbations of chronic cases. Since acute attacks of exophthalmic goitre have many times been reported as having followed severe nervous shock or mental strain, and since it is commonly found that severe strain, mental or physical, will increase the nervous symptoms in most cases of exophthalmic goitre, it is reasonable to suppose that the inevitable mental excitement attendant upon undergoing a serious surgical operation is in itself enough to greatly aggravate the nervous symptoms. For this reason, when operation is proposed in a given case, it is advised to choose for the time of operation a period of quiescence rather than to operate during an exacerbation of the nervous symptoms. To the same end, in an acute case, some advantage may be gained by taking time to prepare the patient for operation by a period of as complete physiological rest as possible. The heart should be carefully studied, and operation not deferred too long in cases where the heart action grows progressively weaker.

The anæsthetic further adds to the danger. In fact, Kocher looks upon the anæsthetic as the greatest danger in operation in such cases. Under the anæsthetic the rapidity of the heart action is further increased, and often to an alarming extent. Some years ago the writer gave the anæsthetic in an operation

by Dr. Lane, of San Francisco, of enucleation of a cystic goitre with signs of Graves' disease, though without noticeable exophthalmos. Billroth's A. C. E. mixture was used, but sparingly, however, for the patient was greatly depressed by it, and the pulse-rate, which had been about 120, rapidly increased to 140, which it maintained throughout the operation. Within twenty-four hours it had increased to 180, and soon to 200 and 260. The heart finally beat itself out, and the patient died within forty-eight hours of the time of the operation. Because of the danger of general anæsthesia, Kocher operates with no other anæsthetic than a small injection of cocaine into the skin, claiming that little pain is caused by the work in the deeper tissues.

Depending comparatively little on what operation is done, the symptomatic rapidity of heart action is invariably increased even independently of the anæsthetic. By those who follow the theory of Moebius of hyperthyroidism, this exaggeration of the nervous symptoms following operation is usually accounted for by supposing that the manipulation of the gland sets free a large amount of thyroid secretion which finds its way into the circulation. In both the cases here reported operation was followed by marked exaggeration of the tachycardia, the tremor, and the sweating, although no anæsthetic was used beyond a few minims of a weak solution of cocaine in the skin.

It is on this ground that attempts have been made to destroy portions of the thyroid gland with a minimum of manipulation such as Jaboulay's exothyropexy, an operation which has not given satisfactory results and which one would suppose to be extremely dangerous from inevitable infection, against which patients suffering with exophthalmic goitre have very little resistance. Ligation of the thyroid arteries, formerly done by Wölfler in ordinary goitre, has been revived and applied to exophthalmic goitre and is being done by Kocher and others for the purpose of causing atrophy of the gland. It has been found that ligation of one artery is not sufficient to produce any marked effect, and to ligate all four of the main arteries while it does not produce gangrene of the thyroid is apt to be followed by myxœdema. From a technical standpoint, it is difficult to see that the ligation of both superior and one inferior thyroid arteries is a much simpler operation than partial thy-

roidectomy, and it must entail more or less manipulation of the gland.

The operations on the cervical sympathetic nerves as performed chiefly by Jaboulay and Jonnesco have not met with very widespread favor. Although a number of apparently successful cases have been reported, they are too few to be the basis of final verdict in regard to the value of the procedure. The operation of Jonnesco, in which the greater part of the cervical sympathetic is removed with the third ganglion, is attended with serious technical difficulties. The operation seems to have its greatest usefulness in lessening the exophthalmos, and some have suggested that the diminution in the size of the goitre as reported may possibly be accounted for by ligation of the vessels in the dissection (Freiherr v. Eiselsberg), but cases have been reported where the operation has been performed through an incision posterior to the sternocleidomastoid muscle, which would be completely posterior to the vessels. Mariani, who reports a remarkably favorable result from the bilateral operation, looks upon the procedure not as attacking the primary seat of the disease, but as purely symptomatic in destroying a portion of the mechanism by which certain symptoms of the disease are produced.

By far the greater number of surgeons reporting results of operation in exophthalmic goitre favor the operation of partial thyroidectomy. Mikulicz would consider it the normal procedure to be modified according to the peculiarities of individual cases. The results of partial thyroidectomy have materially improved in later statistics, largely by reason of the more intelligent selection of cases, choosing the favorable moment for operation, the abolition of general anæsthetic and avoidance of undue manipulation of the gland, and, as advised by Moebius, division of the isthmus with thermocautery or searing the cut surface. Starr's statistics, 1896, of 190 cases showed a mortality of 12 per cent.; Kinnicutt's of the same year, 187 cases, with mortality of 7 per cent., and Rehn's, 1899, 13.6 per cent., with mortality, after ligation, of 48 per cent. Several reports of considerable series have been made in the last two years which are much more favorable. Schulz[1] reports

[1] Schulz. Beitrage zur klin. Chir., Bd. xxx.

20 cases of partial thyroidectomy (including enucleation of adenomata) without a death, although chloroform was used. Of these 18 were traced, and all but one were either cured or very greatly improved, although 14 were bad cases. Wilmer[1] reports 23 cases of exophthalmic goitre treated by operation, 19 being resections, 3 enucleations, and 2 ligations of the thyroid vessels, with 2 deaths. All were followed but one. In 18 the result was satisfactory, and there were 2 failures. Reinbach,[2] studying 18 cases operated on by Mikulicz, reports 21 operations, 16 being resections without a death, and 5 ligations with one death. Of the 18 cases 12 were completely cured, 9 being traced from 4 to 9 years, and 3 more than one year, and 3 cases were greatly improved. In only one case was there a recurrence. Taking these three groups of cases of operation on the thyroid together, there are 65 operations (resections, enucleations, and ligations of vessels), with 3 deaths—a percentage of 4.6 per cent. Fifty-eight patients were traced, of whom 47 (81 per cent.) were cured or had satisfactory result, 3 were improved, and 4 (7 per cent.) were failures or had recurrence.

In 230 cases of partial thyroidectomy collected by Ehrhardt[3] 45 per cent. were cured, 23 per cent. greatly improved, 11 per cent. slight improvement, in 10 per cent. failures, and in 7.5 per cent. deaths. The cases were not separated into genuine and secondary forms.

Case I.—Miss M. A., aged thirty-one years, entered hospital January 4, 1900. Her mother, aged sixty-one years, had had a large cystic goitre since girlhood, but with no Basedow symptoms beyond general nervousness and insomnia. This cyst was ruptured by a fall, and the fluid was absorbed and did not reaccumulate. Patient's grandmother on her father's side had goitre. Patient's goitre was first noticed when she was twelve years of age. It continuously increased in size, slowly at first, rapidly during the last seven years. About 1892 patient began to be troubled with shortness of breath; in 1895 had an attack thought to be dysentery; in 1897 weighed 145 pounds, and was advised to try thyroid extract for the goitre. She took 5 grains twice daily in periods of two weeks, at two weeks intervals, for some

[1] Wilmer. Beitrage zur klin. Chir., Bd. xxix.
[2] Reinbach. Mittheil. a. d. Grenzgeb. d. Med. u. Chir., Bd. vi.
[3] Hand. d. Prak. Chir., 1900.

months. The weight steadily decreased at the rate of five pounds a month until she weighed 115 pounds, the goitre remaining unchanged. She was given fucus vesiculosus, and then potassium iodide in large doses, with no beneficial effects. Beginning in 1895, she had had paroxysms of severe pain in the right side in the region of the liver, gradually increasing in frequency and severity and duration, coming on chiefly at night. In these attacks the pain would be preceded by a period of increased cardiac activity and shortness of breath. The pain would begin as a dull ache, and gradually reach a maximum, radiating over the abdomen, back, and right shoulder, and slowly subside, leaving the right side sore and tender. Jaundice was never observed. In 1899, following prolonged overwork, these attacks became so frequent and severe that she was obliged to give up her work. The condition improved for a time under complete rest, but the attacks recurred with increased severity. Vomiting and excessive perspiration were added. There was no disorder of menstruation beyond pain. She had for years very little use of her voice beyond the needs of conversation, and for two years was unable to make more than slight physical effort without great shortness of breath. She was sent to the writer by Dr. W. F. Cheney, of San Francisco, for operation, he having made the diagnosis of Graves' disease, with compression of the trachea. This latter gave absolute indication for operation, and the occurrence of a paroxysm of pain of unusual severity, lasting four days, during which her parents all but despaired of her life, decided the matter with the patient.

Status. Slight young woman, weighing 100 pounds, presented nearly uniform enlargement of the thyroid, the left side a little larger and extending into the ring of the first rib; dyspnœa considerable, even at rest; respiration noisy from stenosis. Pressure on the tumor caused almost complete closure of the trachea. The goitre was moderately firm in consistency; no cyst or localized tumor definable, no observable pulsation, moving about 3 cm. on deglutition. Patient excessively nervous, restless, with marked tremor, very little exophthalmos (the lid aperture slightly larger than usual). Pulse-rate while at rest in bed, 124 to 130; temperature, 99 to 100.4; pain so great as to prohibit sleep and to require morphine. No jaundice present. Stools normal in color. Entire liver region tender on pressure, moderate spasm of upper abdominal muscles, liver dulness, 9 cm. in mammary line, not extending beyond border of ribs. Under rest in bed for a few days, pulse came down gradually till it ranged from 80 to 100, and the hepatic pain became less, so that patient could sleep at night without opiates.

January 15th, with local anæsthesia (Schleich's solution) of the skin, with morphine, ¼ gr. hypodermically, the left half of the gland with the isthmus were removed. It extended more than 3 cm. below the first rib, pressing on the trachea. But three vessels required ligation. The isthmus, which was 2 cm. in diameter, was ligated and severed, care being taken to avoid the escape of any of the thyroid matter into the wound, and the cut surface was seared with carbolic acid and wiped with alcohol. The wounds in the muscles and fasciæ were closed with chromicized catgut, and the skin with subcuticular stitch of fine catgut. Duration of operation, one hour. For perhaps half the time the patient complained bitterly, but more of choking sensation produced by the traction on the tumor than of actual pain.

Dr. Ophuls, pathologist to Cooper College, reported that the structure was that of a normal thyroid gland with a great deal of colloid in the acini.

During the first twenty-four hours after the operation the patient vomited frequently, perhaps because morphine was given three times, though morphine had been given before the operation without nausea. The pulse was very rapid and weak, 130 to 140. The patient was delirious part of the night, and urinated involuntarily for three days. A few hours after the operation the temperature rose to 101.5°, but subsequently did not rise above 100°, and for three days was from 99° to 100°, reaching 98.4° on the fourth day. For four days after the operation the pulse ranged from 120 to 140, but on the fifth day came down to 84. The wound was dressed on the eighth day; complete primary healing. Patient left hospital on the tenth day.

Patient remained well and gained rapidly in strength and weight—20 pounds in two months—the pulse ranging from 75 to 85; the right lobe of the thyroid then began to enlarge, and after a day of unusual fatigue and excitement the tremor and the tachycardia returned. The pulse rose to 120. Headache, vomiting, and the hepatic pain came on. After a few days in bed these phenomena subsided, to recur again as the goitre enlarged. On re-entering the hospital in May (four months after the thyroidectomy) the pulse ranged from 110 to 120, but after resting in bed for a time went down to from 80 to 100; the temperature, 99° to 100°. May 29th, under chloroform (patient was much less nervous than at former operations and the heart much stronger), a cyst 5 x 7 x 4 cm. was shelled out from the right half of the thyroid. There was no difficulty in the operation; the chloroform was well borne; few vessels had to be tied. The wound was closed without drainage. Immediately after the operation the pulse was 108 to 120, next day reaching 128, and on the second day 136, after

which it gradually went down. On the third or fourth day the patient complained of a feeling of stiffness about the face. There was very definite œdema present of the character of myxœdema. This lasted perhaps a week, and gradually disappeared. The wound was dressed on the sixth day and a little bloody serum evacuated. There was no infection, and the patient left the hospital on the eleventh day. She rapidly improved in general health, was able to take walks of several miles across country. Her voice became stronger than it had ever been, and she was able to sing in her father's choir, something which she had never been able to do. She felt stronger than for several years.

Recently, two years after the thyroidectomy, she writes that her health has been excellent ever since; that only once, after a severe mental and physical strain, had she had a return of the pain in the right side, but this lasted nearly a week; that she has been teaching school for the last five months, working as she has not been able to work for years. She has gained 50 pounds in weight.

Case II.—Mrs. H. O., aged twenty-nine years. Family history negative save as to some distant tuberculosis on the mother's side. She had perfect health until ten years ago, when, at the age of nineteen, she had scarlatina. She has never had other serious illness. She was married a few weeks before the attack of scarlatina, and three months later noticed swelling on the neck on the left side the size of a walnut. A year later she became pregnant, and noticed that the goitre enlarged rapidly as pregnancy progressed, until at term it was the size of a fist. It had slowly increased in size ever since. The labor was protracted, the patient not having strength to expel the child, and forceps had to be used, although the child weighed only six pounds. It died at six months of cerebro-spinal meningitis. About this time, *i. e.*, two years after the goitre was first manifest, shortness of breath became distressing. Two years later, or six years ago, the patient was again pregnant, when the goitre again took on rapid growth. After three months miscarriage occurred. Three or four years ago her eyes were prominent. At this time the menstruation ceased for two years.

Rapid action of the heart, with periods of palpitation, restlessness, shortness of breath, excessive perspiration, flushing of the face, difficulty in speaking, weakness of voice, general muscular weakness, and diarrhœa characterized the further progress of the disease.

Four years ago the patient noticed feet and legs swelling, at first transitorily, but gradually more and more persistently. The swelling finally reached the abdomen and vulva, so that locomotion became difficult. Patient said that recently even the face and hands have

become stiff and rigid from swelling. The swollen parts are numb and cold. The patient has been much troubled with cramps in the legs and arms, and even in the tongue, interfering with speaking. The eyes would at times seem to set so that she could not turn them quickly to look at an object on one side. She complained also of "nervous spells," hot flushes coming on without apparent cause, and with furious perspiration. The patient had no pain beyond an occasional headache, but says the numbness and stiffness in the limbs is very annoying. She is unable to get about and cannot do her housework, and is so excessively nervous that at times she can scarcely keep from screaming out—"feels as if she were losing her mind."

Status, September 11, 1901. Large woman, presenting large goitre overhanging sternum in the middle line and extending upward to the left. It was round and smooth, sharply limited, and freely movable. Tremor was marked, fine in character; pulse, 140; respiration, 50; temperature, 99° by mouth; weight, 152 pounds. The legs, thighs, vulva, and abdominal walls greatly swollen, livid in color, and of cold, clammy surface. The œdema was not like cardiac or renal œdema, but seemed to be of thicker fluid. It pitted only on very deep and prolonged pressure. The face was thick, the cheeks and eyelids stiff, interfering with articulation and facial expression, the swelling noticeable, and the thickening palpable; the hands swollen and stiff. In an attack of flushing and excessive perspiration, as described above, and due to nervousness from undergoing examination, the respiration became 50 or 60 and pulse 140. Slight cyanosis was evident. Circulation in general sluggish; when blood was pressed out of finger-tips it returned slowly. Finger-nails poorly nourished and thin. Lid aperture rather larger than normal, but otherwise exophthalmos was not definite. Urine gave specific gravity 1017, alkaline reaction, with slight cloud of albumin, no sugar, no cylindroids, a small amount of bladder epithelium, with an occasional pus cell.

Besides the fine tremor there were choreic movements, and patient stated that the hands were at times so uncontrollable that she had difficulty in getting her fork to her mouth in eating.

While in bed in the hospital the pulse continued high, 110 to 120, and the respirations 46 to 60. Because of the peculiar character of the œdema, thyroid extract, 5 grs., was given t. i. d. After three days there was no effect on the œdema, but the nervous symptoms were markedly increased, perspiration was extraordinarily profuse, so that the sheets were saturated frequently. Patient became extremely nervous, thrashing from side to side; pulse 100 to 130, temperature 98° to 99.5°, respiration 30 to 60.

September 15th. Operation. While being taken to the operating-room the patient's pulse rose to 160 and respiration to 50, from the excitement. Twenty minims of 1 per cent. solution of cocaine were injected into the skin in two lines over the inner edges of the sterno-cleidomastoid muscles and across above the sternum. After incision in this line and retraction of the depressors of the hyoid, the capsule of the tumor was laid bare and the smooth mass was shelled out without difficulty. There was but little hemorrhage, readily controlled. The muscular layers and the fasciæ were closed with catgut, and the skin with subcuticular suture of fine catgut. During the operation the pulse remained high for perhaps half an hour, but at the end of the operation had come down to 80. Patient did not complain at all of pain during the operation, but afterward said that she had had some pain, but more discomfort from the choking sensation due to the traction on the tumor. Some hours after the operation the pulse rose to 140, temperature 102°, and respiration 50, and there was very little variation in these figures for three days, when they began to recede, until on the fourth day the pulse and respiration were 95 and 30, respectively, and from then on gradually diminished in frequency. On the fifth day the wound was examined and found completely healed. On the sixth day patient was out of bed, on the ninth day walked out into the garden, on the tenth day began to menstruate, on the eleventh day she left the hospital in the following condition: face flaccid or in normal condition, sense of stiffness gone, articulation unimpeded, œdema gone from abdominal walls and vulva, thighs less tense than before the operation, but still hard, circulation improved, perspiration much less, loss of weight, thirty pounds, probably mostly œdema, temperature 97.6° to 98°, pulse 65 to 80, respiration 20 to 25.

After six weeks she returned for observation, gave the appearance of one in good health, had gained twenty pounds in four weeks; feet no longer swollen, face and hands natural; was able to wear gloves two sizes smaller than before the operation; pulse 86, regular; bowels move once or twice a day, instead of fifteen or twenty times, as before the operation; no return of excessive perspiration. One day less than seven weeks after the operation she took a walk to the top of a hill near her home—a climb of nearly a thousand feet in a mile and a half—keeping up with the rest of the party. She found she could lift her legs in climbing over fences, as she had not been able to do for years. The finger-nails show a markedly better nutrition, the newer portions being sharply distinguished by a well-marked ridge, the old nails being about half gone. No enlargement of the thyroid present. The region of the operation soft, the scar scarcely noticeable.

February 26th, five months after operation, patient again returned, with pulse 114 and respiration 28, but she had just walked a considerable distance against a strong wind. After sitting a while the pulse subsided to 80. She said she has had no return of the nervous symptoms. She has been inclined to constipation, and has been obliged to take physic; weighs 151 pounds, a gain of thirty pounds since leaving the hospital. The thighs remain quite hard, otherwise no œdema observable, but the patient says her ankles are a little swollen at night. There is no longer abnormal frequency of urination. Menstruation is regular, but at intervals of three weeks. There is no tremor. Patient says that in walking she can use her legs better than in ten years. She is fond of out-door exercise and takes long walks. On February 20th she walked twenty miles, lugging a bicycle over a muddy road, up and down hill. She was not troubled with shortness of breath, and did not suffer unusual fatigue afterward. She has been doing her own housework for four months, including washing and ironing.

April 12th, seven months after operation, the condition as last reported is unchanged, save that the œdema is apparently a little less, and she continued to feel stronger and be less nervous.

The goitre was examined by Dr. Ophuls, who reported as follows: Tumor the size of an orange, with yellowish-brown cut surface, from which a large quantity of colloid is discharged. In spots, small hemorrhages. The tumor consists of spherical follicles filled with colloid. The thin partitions between consist of fibrous tissue with bloodvessels. In spots, the lymph spaces in the fibrous tissue are much dilated and filled with colloid. Some of the follicles have ruptured and discharged their contents directly into the interstitial connective tissue. Diagnosis, adenoma thyroideæ colloides.

To recapitulate: In both cases the symptoms indicative of Graves' disease were secondary to pre-existing goitre; both cases were chronic and were characterized by increased rapidity of heart action, fine tremor, increased rapidity of respiration, excessive nervous sensibility, diarrhœa, periodical increase of these symptoms, with remissions, constant slight rise of temperature, dyspnœa, general muscular weakness, flushings, and sudden periods of excessive perspiration. In the first case, extraordinary attacks of severe pain in the region of the liver; in the other, a curious, general, non-pitting œdema. In neither case were there characteristic changes in the histological appear-

ance of the tumors. In both cases operation was followed by temporary increase of the nervous symptoms, this followed by gradual remission, the one case having recurrence concomitant with development of a cyst in the remaining portion of the gland, relieved by second operation. No further recurrence of nervous symptoms in either case, the one being observed for two years, the other for seven months.

From the stand-point of technique in the operation, neither case is of any particular interest, save that the operations were done without an anæsthetic beyond the local use of a small amount of cocaine in the skin, and that the suffering caused by the manipulation of the deeper parts was bearable and due more to interference with the respiration and the sensation of choking caused by traction on the tumor than to severe pain.

[Since the above was written an elaborate article on the subject of exophthalmic goitre has been published by Dr. Albert Kocher,[1] in which a most painstaking review is made of all the cases occurring in Prof. Kocher's clinic in Bern. The report gives in detail the histories of 93 cases: 59 were operated on, of which 37 were severe cases and 22 moderately severe, or with one or more symptoms lacking; 45, or 76 per cent., remained cured; 8, or 14 per cent., were definitely improved; 2, or 3.3 per cent., slightly improved, and 4, or 6.7 per cent., died. On the basis of the results of operation in these 59 cases Kocher makes a strong plea for the operative treatment of exophthalmic goitre.]

[1] Mitth. aus den Grenzgeb. der Med. u. Chir., 1902.

EXCISION OF THE LUMBAR LYMPHATIC NODES AND SPERMATIC VEIN IN MALIGNANT DISEASE OF THE TESTICLE.

By JOHN B. ROBERTS, M.D.,
PHILADELPHIA.

(A Contribution from the Surgical Laboratory of the Philadelphia Polyclinic.)

There will probably be little dissent from the proposition that operations for malignant disease should usually include removal of the adjacent lymph nodes. In mammary carcinoma, surgeons remove not only the entire mammary gland and its surroundings, but also the axillary lymph nodes and fat. Some of us extirpate, also, the nodes above and below the clavicle. The lymph nodes are similarly excised in malignant tumors of the lower lip, at the time the growth is extirpated. An operation for malignant disease can scarcely be called complete unless this precaution is taken. To permit the lymphatic glands to remain until affected by secondary involvement is a grave error of judgment.

It is usually wise to remove the lymphatic glands or nodes before the tumor is attacked, because it is possible that the handling of the tumor, necessitated by the operative manœuvres, may press cells from the focus of the disease into the lymph current. As soon as possible after a diagnosis, or probable diagnosis, of malignant tumor is made, the patient should submit to operation. This should begin with removal of the nearest chain of lymph nodes and be immediately followed by radical extirpation of the growth and its surroundings.

The combination of an early and radical operative attack will give the best opportunity for the patient to escape death. Fatal results may occasionally follow such surgical methods, but the

risk must be taken in the struggle with a relentless enemy. At the incipiency of malignant disease the process is local and extirpation therefore possible. It is usually better to do no operation than one that is evidently incomplete.

These views have led me to advocate and employ more radical procedures in malignant disease of the testicle than those which have usually been adopted. The testicle is liable to become the seat of carcinoma and sarcoma. The former gives rise to secondary involvement by the lymph current; the latter, by the venous blood current. The testicle is suspended from the trunk in a manner that makes it, in a way, a pendulous extracorporeal organ. Hence, it seems as if malignant disease there ought to be more successfully combated by early operative intervention than in any other region. We know that early and radical operations in malignant tumors of the breast are successful in many instances in preventing local return and secondary metastatic involvement. The anatomical situation of the testicle would seem to promise better results, were the same thoroughness employed in the operative attack.

The blood current from the testicles runs in the spermatic veins; the lymph current in the corresponding lymph vessels. Both kinds of vessels enter the abdomen, as is well known, by the spermatic cord. The right spermatic vein then ascends and empties into the vena cava at about the level of the upper edge of the third lumbar vertebra; the left, into the left renal vein at about the level of the lower edge of the second lumbar vertebra. The lymph vessels reach no lymph nodes until they pass into the lumbar nodes.

It is desirable to know with accuracy into which of the lumbar nodes the spermatic lymphatics first empty. It is admitted that they seldom enter a node until they reach the lumbar lymphatic plexus. Whether they empty first into the lower or upper lumbar nodes, and whether the nodes in the middle line, lying over the aorta, or those at the sides of that vessel are the first to receive the lymph from the testicle and its deep coverings are questions of importance.

That the lymphatic drainage of the scrotum and superficial

parts of the genital organs goes to the inguinal glands is well established. This fact makes it wise to extirpate the inguinal nodes in testicular carcinoma and sarcoma

The writers on anatomy are not very definite and are not quite in accord as to the point under discussion. Gray[1] gives an illustration of the lymphatics from the testicle emptying into the lateral lumbar glands in front of the psoas muscle. Leidy[2] says that the half-dozen or more spermatic trunks are remarkable for their great proportionate size and terminate in the upper lumbar glands. This statement accords pretty well with the figure given in Gray. The description given by Macalister[3] is to the effect that the lumbar lymphatic plexus is very large and loose-meshed, and lies at each side of the aorta and in front of the psoas muscles, and that the vessels are united across the aorta by a median aortic lymphatic plexus with about six glands in its course. The vessels of the lumbar plexus begin, according to Macalister, below by receiving the vessels of the common iliac and sacral plexuses. Where these join there are usually four or five glands, the efferent vessels of which receive the spermatic lymphatics from the testis and its deep coverings.

Gerrish[4] shows in a diagram the lymph vessels from the testicle running to the lowest one of the median lumbar glands. There is a communicating branch from this node to the median node immediately above it, and one to the lowest lateral lumbar node. This diagrammatic sketch would scarcely be mentioned in this discussion, were it not that Dr. Gerrish has been particularly interested in studying the course and distribution of lymphatic vessels. I am, therefore, somewhat inclined to accept this schematic illustration as evidence that he believes that the lymph current from the testicles flows directly into the lower part of the median chain of glands, as a rule, and not directly into the lateral or upper glands. Dr. Gerrish divides the lumbar lymphatic nodes into the median, situated close to

[1] American edition of 1887, p. 647.

[2] Edition of 1889, p. 589.

[3] American edition of 1889, p. 432.

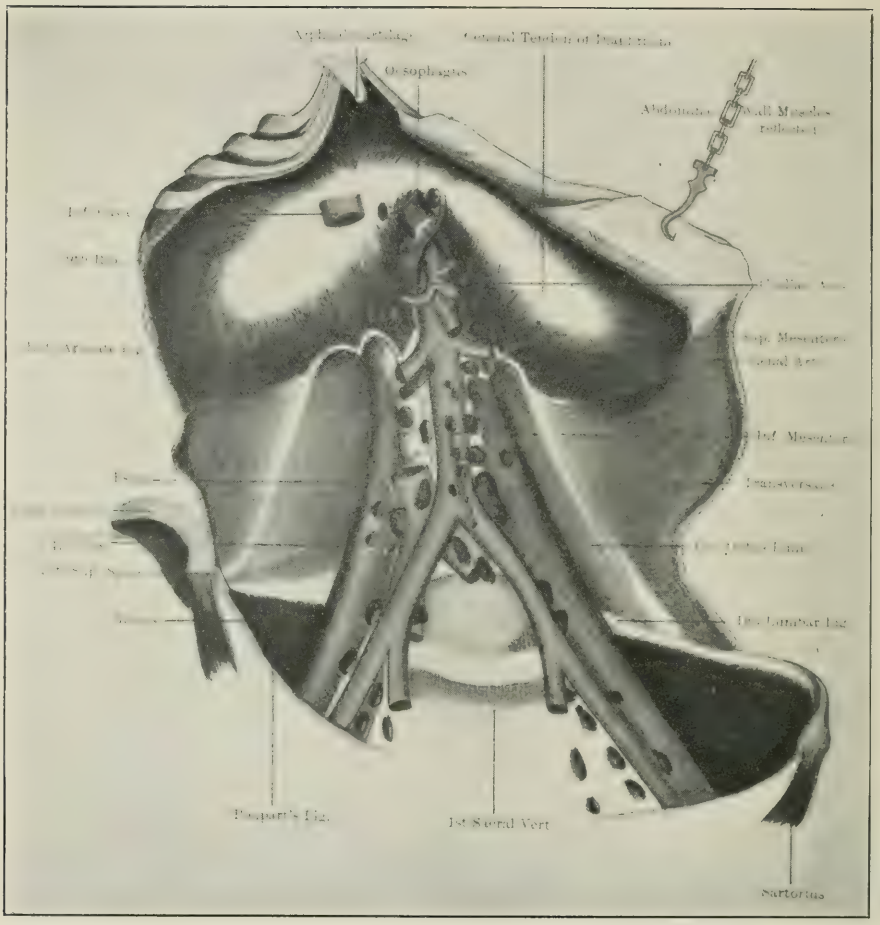
[4] Text-book of Anatomy, by American authors, p. 496.

the abdominal aorta, and the lateral, lying in the spaces between the transverse processes of the lumbar vertebræ. He says that the supply of lymph to the median nodes comes from the body of the uterus, the ovaries and the Fallopian tubes, the testicles, the kidneys, the ureters, the diaphragm, the suprarenal bodies, and the external iliac, internal iliac, sacral and lateral lumbar nodes; and that the trunk by which they discharge into the receptaculum is joined by the efferents of the lower part of the descending and the whole of the sigmoid colon. He says that the afferents of the lateral lumbar nodes come from the lower part of the spinal canal and the dorsal and lateral portions of the abdominal walls, and that their efferents run to the median lumbar nodes and the receptaculum. His diagram shows five median lumbar and seven lateral lumbar nodes.

Testut[1] divides the abdominal nodes into lumbar or lateral, preaortic or median, and visceral. He describes the lateral or lumbar as lying on the sides of the vertebral column and aorta and vena cava, forming an uninterrupted chain, which extends from the middle portion of the primitive iliac artery to the first lumbar vertebra. He says that Sappey counts twenty to thirty on each side. Testut says that the median, which he also calls the preaortic or supra-aortic nodes, lie in front of the aorta and inferior cava, with some of them insinuating themselves between these vessels. He describes them as an uninterrupted chain extending from the bifurcation of the aorta to the upper border of the pancreas. His description of the spermatic lymphatics is that they arise from the testis, epididymis and vas deferens, and unite in seven or eight large trunks which follow the course of the spermatic artery and vein, being part of the spermatic cord, and empty into the lumbar nodes at the level of the kidneys. This description seems to correspond with that of Leidy and Gray rather than with that which I have mentioned as the possible opinion of Gerrish. It seems to be also in accord with probabilities, for the spermatic veins and

[1] Traité d'Anatomie Humaine, i. p. 1165.

FIG. 1.



Dissection showing lymph nodes near abdominal aorta. (From LEAF.)

arteries communicate with the general circulation just about the level of the kidneys.

The accurate study of the lymphatic glands made by Cecil H. Leaf[1] contains an excellent colored illustration of the distribution of the lymphatic glands about the abdominal aorta. This authority, however, makes no attempt to describe the vessels communicating with these glands or nodes. He says that the glands in relation to the abdominal aorta may be divided into a mesial and a lateral set. The lateral set he calls the lateral aortic or lumbar. The lower ones of the mesial set he calls the inferior mesenteric. He says that four or more small glands lie over the aorta and partially surround the inferior mesenteric artery. The figure is understood to be illustrative of the mean distribution of the glands; for the author admits that the distribution of the lymphatic nodes in the various parts of the body is not constant. He says that the lateral aortic, or lumbar, as he calls them, are seven or more in number, and are situated on both sides of the aorta upon the vertebræ. On the right side the lateral group lie, according to Leaf, for the most part, entirely under cover of the inferior cava, though three or more are often found lying on its anterior surface. One of the glands on the front of the psoas muscle is stated to be often seen to lie in close relation to the spermatic vein shortly before it terminates in the vena cava or left renal vein. This is probably an important one in our study.

In a painstaking study of the manner in which metastasis occurs from malignant tumors of the testicle, Most[2] made injections of the lymphatic vessels. His diagram of the result shows the lymphatic vessels from the testicles emptying into lymphatic nodes in front of and alongside of the aorta at the level of the kidneys. There are, however, lower nodes in the vicinity of the bifurcation of the aorta, and other nodes behind the aorta and vena cava, which also received the injected pigment.

[1] The Surgical Anatomy of the Lymph Glands, Westminster, 1898.

[2] Ueber maligne Hodengeschwülste und ihre Metastasen. Festschrift gewidmet Herrn Prof. Dr. Emil Ponfick, 138. Breslau, 1899. Also in Virchow's Archiv für pathologische Anatomie und Physiologie, 154.

It is very evident that the communication between the nodes is quite free. The general metastasis occurring so often from testicular carcinoma is easily explained by the anatomical course of the lymph current, which so easily reaches the receptaculum chyli, and from it the general blood current.

Dr. Most says there is no barrier between the testicle and the thoracic duct except the lumbar nodes, and that this is an imperfect guard. He says that the first nodes reached by the lymph flow from the right testicle lie on the vena cava, and that the first ones reached by the current from the left testicle lie near the aorta. These primary nodes lie at about the level of the lower pole of the kidney. The nodes can be shown to communicate rather freely with each other by means of anastomosing vessels, and Most was able to send an injecting fluid from the testicle all the way up to the entrance of the thoracic duct into the subclavian vein.

The anatomical arrangement suggests the proper surgical steps for curing by extirpation malignant disease of the testicle.

The lymph coming from the testis empties, as has been shown, into nodes in front and alongside of the aorta and vena cava. About the level of the lower pole of the kidney seems to be the usual situation of the first nodes reached by the ascending lymph stream. Those as far down as the bifurcation of the aorta have, however, rather free communication with the nodes thus first reached. In operating to excise the nodes likely to show metastatic involvement from malignant growths in the testicle, it is probably wise to remove all of them that are accessible, from the level of the aortic bifurcation up to the level of the renal veins.

The certainty or probability of malignancy being present should determine immediate operation. The first step should be to open the abdomen in the middle line, remove all the accessible lymph nodes in the vicinity of the aortic bifurcation, excise a couple of inches of the spermatic vein of the diseased side, and close the abdomen. The second step should be the removal of the inguinal lymph nodes, the spermatic cord from the internal ring downward, the diseased testicle, and the lateral

FIG. 2.

Injection of the retroperitoneal lymph vessels and nodes connected with the testicles. The nodes, indicated by black dots, are covered by overlying structures, and are not visible until these structures have been lifted up. The vena cava has been drawn a little to the right. The figure is a combination of two experimental injections—one from the right and one from the left testicle. A node at *a* received the coloring matter from both testicles. The direct communication with the receptaculum chyli is seen on both sides. (From MOST.)

half of the scrotum. By operating in this manner and in this succession, the filter-like nodes and the channels, by which the abnormal cells or causative micro-organisms enter the system, are separated from the patient early, the danger from manipulation of the testicle pressing these morbific agents into the circulation is reduced to a minimum, and the probability of both local and metastatic return is largely decreased.

If the exact nature of the pathological process is known, it may be sufficient to excise the lumbar nodes and leave the spermatic vein untouched in carcinoma, or to resect the vein and leave the lymph nodes undisturbed in sarcoma. When no such exact knowledge exists, it is probably wise to operate upon both nodes and vein, for the operative risk is very little increased thereby. It would be possible, in some instances, perhaps, to delay operation a few days until a microscopic examination be made of a fragment of the tumor taken for the purpose from the testicle.

If it is true, as Leaf's dissections[1] seem to show, that small lymph vessels and veins freely communicate, both nodes and veins should probably be excised in all cases, whether the disease be carcinoma or sarcoma.

The abdominal incision should be median, and extend about two inches above and about two inches below the navel. The small intestines should be pushed to the right side of the patient and the posterior layer of the peritoneum opened over the aortic bifurcation. Care must be taken to avoid injuring the inferior mesenteric artery, alongside of which will be seen lymph nodes. These nodes are not to be disturbed, because they receive lymph from the intestines and not from the testicles. The nodes to be excised lie upon and at the sides of the aorta from the bifurcation up to the level of the renal vein. They vary in size, being often not larger than a grain of wheat, and may be embedded in fatty tissue. The safest course probably is to remove all the adipose tissue found in front of the aorta and cava and at the sides of these great bloodvessels. It is, per-

[1] The Surgical Anatomy of the Lymphatic Glands, by Cecil H. Leaf. Westminster, 1898.

haps, wise to excise the glands on both sides of the median line, though only one testicle be diseased.

Resection of the spermatic vein should be restricted to the side corresponding to that of the malignant tumor. I have not performed this operation, and feel that there may be some difficulty in its application to the living subject. Studies on the cadaver have, however, made me believe the phlebectomy possible.

The two veins ascend in the respective spermatic cords and lie about one inch to the right and left of the middle line of the aorta, at the level of its bifurcation. They are situated rather deep in the hollow alongside of the spine. As they ascend they perhaps come a little nearer to the aorta. The pulsation of the spermatic artery, which accompanies the vein for some distance, may possibly aid in the recognition of the latter vessel. The ureter lies more deeply than the spermatic vein and a little further from the middle line. It is thicker and more resistant to the fingers than the vein ; but as it is practically parallel to the latter it may be mistaken for it. The operator should not forget the possible existence of two ureters on one side. Pressure on the supposed vein at the upper part of the abdomen will cause it to become distended with blood and aid in clearing up doubt as to its identity. There is a vein running almost parallel with the left spermatic vein which is smaller and more superficial than the latter. As it empties into a large vein running more or less transversely, it might readily be mistaken for the left spermatic emptying into the renal vein. This vein is the inferior mesenteric coming from the intestines and opening into the splenic vein. It must be avoided, because injury to it might be disastrous in its later consequences.

When the spermatic vein has been recognized with certainty, it should be ligated with two catgut ligatures placed about two inches apart. The intervening portion of the vein should then be excised.

The present anatomico-clinical study was incited by an excision of the lumbar nodes, in October, 1901, in a case of recurrent carcinoma of the testicle and spermatic cord.

A Case of Excision of the Lumbar Lymph Nodes in Recurrent Carcinoma of the Testis and Spermatic Cord.

A gentleman, sixty-eight years of age, had noticed an enlargement of the left testicle in May, 1900. There had been no known traumatism. The condition was recognized as malignant by Dr. C. M. B. Cornell, of Ontario, who in July of that year removed the testicle and vaginal tunic. In July of the following year (1901) excision of a recurrent tumor at the site of the original trouble and of markedly enlarged inguinal lymph nodes was done. The cord was divided high up, where it showed no macroscopic evidence of disease; and all the lymph nodes discoverable above and below Poupart's ligament were extirpated. The pathological report was to the effect that the growth was squamous-celled carcinoma.

Two months later (September, 1901) a small nodule appeared at what seemed to be the end of the cord. The patient consulted me, at the instance of Dr. Cornell, in October, 1901.

The evident virulence of the malignant disease caused me to undertake a more radical operation than has, so far as I know, been done to avert the fatal issue in such testicular growths. I removed the lumbar lymph nodes, into which the lymph vessels from the testicle and spermatic cord empty, and made a wide excision of the small inguinal tumor. The known tendency of testicular tumors to invade by metastasis these nodes and the general system made this operation justifiable.

It was on October 16, 1901, that I made a median incision from the umbilicus to within an inch of the pubes, but found that the thickness of the abdominal wall was so great that this did not give sufficient opening. I accordingly divided the skin and the left rectus muscle by an incision running toward the anterior superior spine of the left ilium. Before cutting the muscle I inserted heavy sutures into it, above and below the proposed incision, to aid in controlling the contracted ends when closing the abdominal wound.

The peritoneum in front of the aorta was divided, and the fatty tissue, lying over that vessel at its bifurcation removed. In this fat I recognized several small lymphatic nodes which were of normal appearance to naked-eye examination. A good deal of time was consumed in excising with scalpel and scissors this preaortic cellulo-adipose tissue. The seat of operation was deep, for the patient was

of large frame and very fat. No lymph nodes were recognizable through the overlying tissues, for they were of normal size and enveloped in the fatty tissues. As I removed successive pieces of tissue I felt and demonstrated the enclosed nodes. I desisted when the front of the aorta was denuded from its bifurcation to a point about two inches higher up.

The growth in the groin was then excised with a portion of overlying skin and a couple of inguinal lymph nodes, and the incisions were carefully closed with sutures.

After the operation the patient showed signs pointing to intestinal obstruction, but the tympany was finally relieved, and bowel movements were obtained by enemata and saline laxatives. At the end of a week the abdomen was flat, and my uneasiness on that score was relieved. About this time suppuration in the median wound occurred, and finally required the sutures in the skin and superficial fascia to be removed for nearly its entire length. A fecal fistula occurred about two weeks later. Attempts were made to close this by a Murphy button, which was extruded from the wound; and later by circular enterorrhaphy.

Death occurred on December 8th, two days after the last operation, and was evidently from peritonitis. The wound in the groin had healed by first intention; but a few weeks before death a small tumor appeared in the region of the scar. This was evidently a local recurrence of the malignant disease.

I was not able to determine the cause of the temporary intestinal obstruction or of the fecal fistula. They were incidents not necessarily associated with the excision of the lymph nodes.

The report of the pathological examination of the tumor of the groin, made by Dr. B. M. Randolph, Jr., Director of the Polyclinic Laboratory, is as follows: "Supporting structure of adult connective tissue, more or less dense, and honeycombed with alveolar spaces. In this connective tissue are a moderate number of bloodvessels with walls of normal or slightly increased thickness. Alveoli are of various sizes and shapes—spherical, ovoid, and irregularly fusiform. They are more or less compactly filled with cells of various shapes and sizes of the epithelial type, with large oval nuclei, which stain with varying degrees of intensity, and present one and frequently two prominent nuclei.

"The pathological findings in the four excised lumbar lymph nodes prove that the malignant process had just reached those structures by

metastasis. The section from lumbar lymph node No. 1 showed 'connective tissue capsule sending prolongations into substance of organ, forming alveoli. These alveoli are filled with round mononucleated cells of uniform size (lymphocytes) giving the ordinary appearance of lymphatic gland. Scattered among these lymphocytes are a very few flat cells of irregular polygonal shape with oval nuclei.'"

The section from lumbar lymph node No. 2 presented the same appearance as the section from No. 1.

The sections from the lumbar lymph nodes Nos. 3 and 4 "show no departure from normal histology of lymph glands."

Diagnosis. Carcinoma. Beginning metastasis of lumbar lymph nodes.

THE INFLUENCE OF THE ROENTGEN RAY UPON THE DIFFERENT VARIETIES OF SARCOMA.

By WILLIAM B. COLEY, M.D.,
NEW YORK.

As far as I have been able to ascertain from a careful search in the literature of the Roentgen rays, this treatment has been employed in but a very small number of cases of sarcoma.

Dr. Williams, in his recent paper read before the New York Academy of Medicine, stated that he had one case of spindle-celled sarcoma which showed marked improvement.

Dr. A. W. Pusey, of Chicago, who has done so much and such excellent work with the X-ray in malignant disease, in his recent paper entitled "Report of Cases Treated with Roentgen Rays"[1] reports four cases of tuberculosis of the skin; eight cases of epithelioma of the face and nose; five cases of carcinoma of the breast; six of deep-seated carcinoma of neck and head; four of carcinoma of the abdominal cavity, but only three cases of sarcoma. One of these, an osteosarcoma of the right shoulder with cachexia and evidence of general sarcomatosis, was given six exposures without effect upon the tumor other than causing considerable relief from pain. The second case, a woman aged sixty years, with extensive inoperable sarcoma of the right pectoral muscles and shoulder, was treated for a month, with considerable relief from pain, but with no apparent effect upon the tumor. The third case was that of a man, aged twenty-four years, with a history of round-celled sarcoma of the left side of the neck, first noticed in February, 1901. Four months later a tumor developed on the right side. In August, 1901, the primary tumor was removed by Dr.

[1] Journal of the American Medical Association, April 12, 1902.

Ochsner, and the patient was sent to Dr. Pusey on September 2d for the X-ray treatment of the other side. At the time of the beginning of the treatment there was a hard, diffuse swelling, immovable, rendering the neck almost completely rigid. Under one month's X-ray exposures this tumor entirely disappeared, as shown by the two photographs in the article. The patient gained twelve pounds in weight. Five months later, however, there was a slight recurrence. Further treatment was advised, but the patient thought it impossible to return to the city. The diagnosis of this case was made by Dr. F. R. Zeit, Associate Professor of Pathology at the Northwestern University, who stated that it was unquestionably small round-celled sarcoma.[1]

Under date of November 16, 1901, Carl Béck, of New York (*New York Medical Journal*) published a case of recurrent melanosarcoma of the thigh and groin, in which the X-rays showed a very decided inhibitory action. There was marked improvement, but the case was too far advanced to expect a cure. The patient has since died.[2]

The next case, in point of time, that I have been able to find is that of a round-celled sarcoma of the neck, treated by Dr. C. E. Skinner, of New Haven, and published by Dr. Frank A. Kirby (*Journal of Advanced Therapeutics*, February, 1902). This case is a very striking one, and deserves to be referred to in detail.

The patient, male, aged sixty-four years, three years ago received a blow upon the neck from a wagon pole, leaving a contusion which lasted about a week. Two months later a swelling appeared at the site of the injury. This grew very slowly for about sixteen months, when the patient severely wrenched his neck. Almost immediately afterward the tumor began to grow more rapidly, and became painful. By November, 1901, the tumor had become very large, and occupied the greater portion of the left mastoid and cervical region, measurements

[1] In the discussion of the paper (June 5, 1902) Dr. Ochsner stated that the patient had returned to Chicago for treatment, and that the recurrent growth had again disappeared under the X-ray.

[2] The patient was shown before the German Medical Society in May, 1901.

being seven inches laterally, ten inches vertically, with some ulceration and breaking down. Microscopic examination by Dr. Archibald McNeal, of the New Haven Board of Health, showed the tumor to be round-celled sarcoma. The X-ray treatment was begun November 20, 1901, by Dr. Skinner, a Van Houten & Tenbrook 32-inch twelve-plate static machine being used. Dr. Skinner states that in the incredibly short space of time of six weeks the patient was apparently cured, the tumor having disappeared, the surface healed, and the patient being free from pain, and able to resume his work.

On June 27, 1902, I made a personal examination of this case and found the following condition:

In the left side of the neck and mastoid region is a very large, broad cicatrix, measuring 2½ by 3½ inches, but there is absolutely no trace of a recurrent growth. In the lower part of the cervical region there can be felt on deep pressure very slight enlargement of one or two of the deep cervical glands, apparently no larger than peas.

Inasmuch as so few cases of sarcoma have as yet been treated by the X-ray, I feel justified in giving a brief sketch of the histories of my own cases. The whole method is still in the experimental stage, and I do not pretend that the technique that I have employed should be taken as a guide for others. I merely wish to place these cases before you as a slight addition to the slender data we now possess upon which to base an opinion as to the therapeutic value of the Roentgen ray upon malignant tumors.

Case I. *Inoperable Round-celled Lymphosarcoma of Neck, Pectoral Region, and Axilla.*—M. L. A., female, aged forty years. First noticed a tumor just above the clavicle, about two years ago. This was removed. Shortly after this a recurrence was noted in the right cervical region, which grew with great rapidity, very quickly involving the axillary glands on the same side. In July, 1900, the axillary tumor was removed by Dr. C. B. Nancrede, of Ann Arbor, Mich. The tumor in the cervical region showed such extensive involvement of the deeper structures that it was considered entirely inoperable. Microscopic examination was made by Dr. King, of the Dartmouth Medical School, who pronounced it small round-celled sarcoma. The patient was referred to me by Dr. Nancrede for the toxin treatment, in October, 1900. Physical examination at this time showed a large

FIG. 1.

CASE I. Round-celled sarcoma of neck, pectoral region and axilla, three weeks after X-ray treatment.

FIG. 2.

CASE I. Round-celled sarcoma of neck, pectoral region and axilla, after three months' treatment.

FIG. 3.

CASE I. Round-celled sarcoma of neck, pectoral region and axilla, after three months' treatment. Front view.

FIG. 4.

CASE I. Round-celled sarcoma of neck, pectoral region and axilla, after four months' treatment. Tumors both sides of neck entirely disappeared.

tumor in the right cervical region, extending from the clavicle to the mastoid process of the temporal bone. There were some enlarged nodules below the clavicle, and several small tumors in the region of the cicatrix in the axilla. The toxins were begun at the General Memorial Hospital, October 1, 1900, and continued, with intervals of rest, for six months. There was a very decided decrease in the size of the tumors, and increase in their mobility. This continued for about three months, and then, in spite of further injections, the improvement ceased. At the end of six months the growth slowly began to increase in size, and it was not thought wise to further continue the injections. Since June, 1901, no treatment further than palliative has been used, and the patient has since then been awaiting with great courage and composure what was regarded as the inevitable and not long to be delayed end. The tumors slowly but steadily increased in size, and in the beginning of March, 1902, her condition was as follows: A tumor mass encircled the entire neck, ending at the vertebral line, and extending from the mastoid process to the clavicle on the left side, on the right side involving the entire cervical, supraclavicular, pectoral, and axillary region. The largest protuberance was in the right cervical region, about the size of two fists. The constriction of the trachea was so great as to cause frequent and severe attacks of dyspnœa. She was confined to the bed the greater part of the time. With little hope of causing even temporary improvement, but more as a matter of experiment, I determined to try the X-ray. The treatment was begun February 10, 1902, four to five exposures per week, at a distance of eight inches, being given. At the end of three weeks a marvellous change had taken place. The tumor masses had decreased fully one-third in size and had become very movable. A small burn was produced in the upper right cervical region, over the most protuberant part of the tumor. The skin in this place had become very thin from the pressure of the disease. The burn healed in two to three weeks. The treatment has been kept up at the rate of four exposures a week until the present time, and rapid improvement has continued steadily. To-day (June 5th) the patient has entirely recovered her general health, and she is able to go out walking and driving daily. The tumor masses on the left side have entirely disappeared with the exception of one or two small nodules not larger than peas. On the right side, on which the tumor mass was nearly as large as two fists, there now remains a mass not larger than an olive. The masses in the front, over the trachea

and extending into the mediastinum, have entirely disappeared, as well as those in the supra- and infraclavicular regions. There remains a small nodule in the right axilla, about the size of a hickory-nut.

On June 18th the small nodule in the neck was removed under ether for the purpose of making a microscopic examination, with a view of finding out what changes had taken place in the structure of the tumor. The nodule was situated just beneath the inner edge ot the right sternomastoid muscle, near the middle, and was no larger than a small marble (one-half inch in diameter). The microscopic examination, made by Dr. George P. Biggs, Pathologist to the New York Hospital, was as follows:

The material, received in alcohol, consists of two encapsulated masses, one measuring 2 x 1½ x 1¼ cm., and the other 1 x ¾ x ¾ cm.

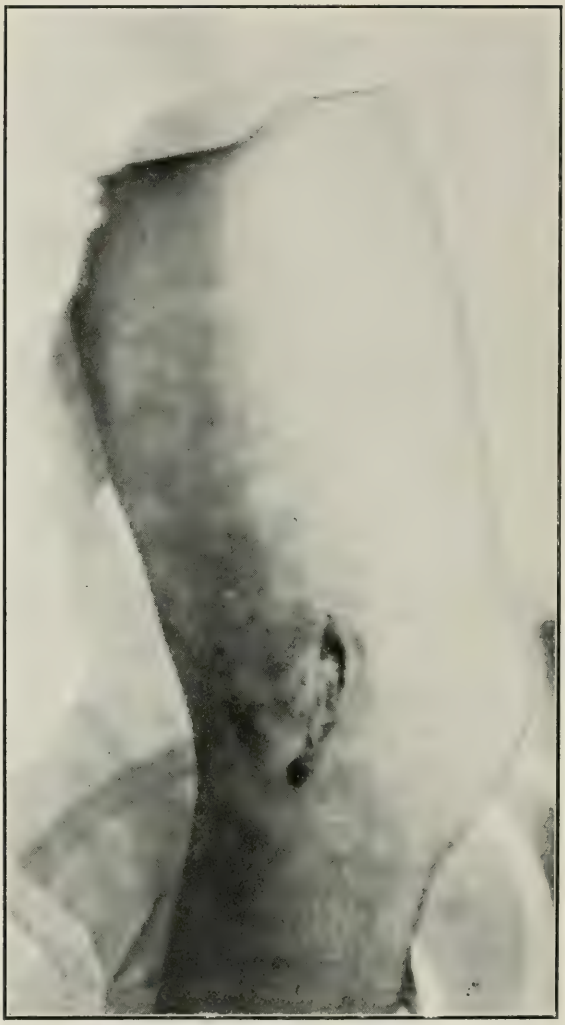
Microscopic examination of each shows a cellular fibrous capsule enclosing tissue which has the structure of a lymphosarcoma. In addition to the predominant small round cells there are a very few small spindle cells and an occasional large round cell having one or two nuclei. The fibrous stroma is in the form of a fine network, and the vascular supply is fairly abundant. Outlines of the cytoplasm of the cells is generally indistinct. The chromatin of many of the nuclei is largely in granular form, leaving a pale chromatin network. In other cells the chromatin is largely at the periphery of the nucleus, leaving an almost colorless centre. There are also cells which have almost entirely lost their normal staining power. These nuclear changes, combined with the presence of chromatin granules and amorphous matter between the cells, point clearly to a cellular necrosis. That such necrobiotic changes might be found under various conditions must be admitted, but they would seem to offer a rational explanation of the gradual and almost complete disappearance of all signs of the tumor in this instance. It is unfortunate that comparison cannot be made with sections of the tumor before treatment.

The report of the blood examination, made by Dr. L. H. Warner, of New York city, reads as follows: Hæmoglobin, 65 per cent.; red cells, 3,800,000; white cells, 8900.

Pathological Count of Leucocytes. Lymphocytes, 22 per cent.; polynuclear, 60 per cent., some neutrophile; eosinophiles, 12 per cent., multinuclear; myelocytes (small), 4 per cent.; myelocytes (large), 2 per cent.

Blood picture presents a slight eosinophilia, and also leads to a probable diagnosis of sarcomatous nodules.

FIG. 5.



CASE II. Sarcoma of femur shortly after beginning of treatment. Nearly disappeared in six months' X-ray treatment.

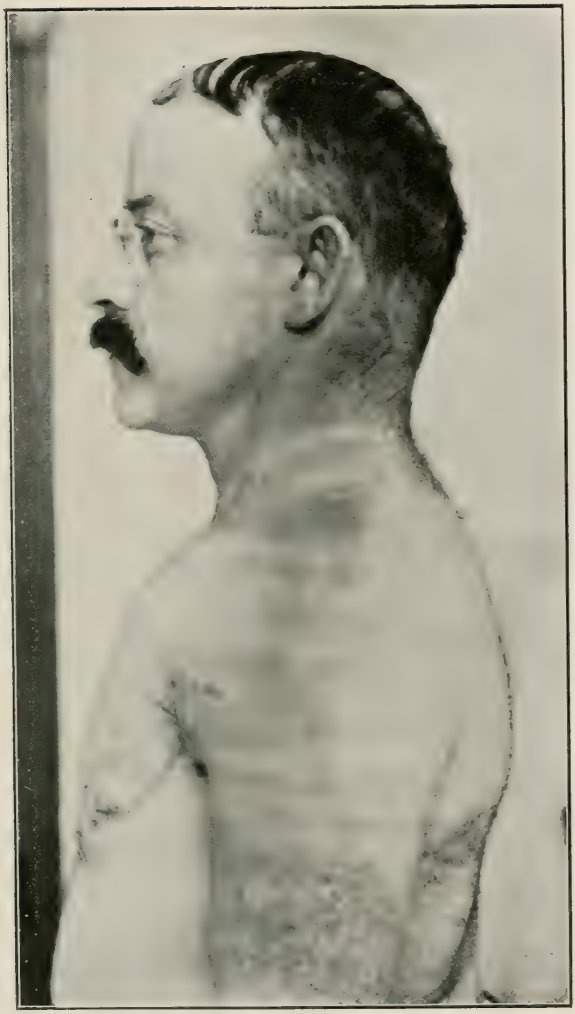
Later History, September 30, 1902. The patient left the hospital July 8, 1902, apparently well. She went to the mountains until September 24th, when she returned to the city. Examination now shows a small recurrence in the left parotid region, with an enlargement of both inguinal glands. There is also an intra-abdominal mass in the right hypochondriac region, about the size of an orange. The X-ray treatment has been resumed.

Case II. *Sarcoma of the Femur.*—A. G., aged nineteen years. First noticed a swelling in the lower portion of the left femur in November, 1901. This gradually increased in size and was accompanied by loss of weight and deterioration of general health. The patient came under my observation February 5, 1902. At that time physical examination showed a large tumor extending from the condyles of the left femur to the junction of the middle and upper thirds. The tumor consisted of a fusiform enlargement of the entire lower two-thirds of the femur; on the outer aspect of the thigh, about 1½ inch above the joint, there was a soft, fluctuating area, just covered by thin and reddened skin. There was also impairment of the functions of the joint, but no swelling of the joint itself. An incision was made under cocaine into the fluctuating area, and three ounces of clear serum, similar to that which is found in cystic degeneration of sarcomatous tissue, was evacuated. The curette passed into the cavity of the bone, and typical sarcomatous tissue was removed. Microscopic examination by Dr. E. K. Dunham showed it to be round-celled sarcoma. The patient absolutely refused operation, although he was told that this was the only thing that offered any hope of saving his life. The X-ray treatment was tried entirely as an experiment, with the result that the tumor decreased one inch in circumference. After a month's treatment the exposures were discontinued for two weeks, at the end of which time the tumor had increased nearly an inch in size. The treatment was again resumed and the growth slowly decreased in size, until at the end of another month the circumference of the thigh over the centre of the tumor was one inch less than the original measurement. The treatment has been continued four times a week up to the present time, June 3d, with slow decrease in the size of the tumor, although the patient has lost two pounds in weight. During the last week, however, he has developed signs in the right lung which point very strongly toward beginning of metastases. The tumor shows a decrease in size of two inches from the original measurement.

Later History, September 30, 1902. The suspicious signs in the lung have cleared up. The leg is nearly normal in size, and the patient has gained twenty pounds. The treatment has been kept up until the middle of September, a period of seven months.

Case III. *Small Round-celled Sarcoma of the Pectoral Region.*— E. M., aged thirty-five years ; family history good. First noticed a tumor in the right pectoral region, near the anterior axillary line, in the latter part of 1898. This grew rapidly in size, and was operated upon by Dr. Maurice H. Richardson in November, 1900. The tumor at that time was the size of a fist. Extensive removal of the mass and part of the muscle was made. Microscopic examination by Dr. W. F. Whitney, Pathologist to the Massachusetts General Hospital, showed the growth to be small round-celled sarcoma. The tumor recurred about six months after operation, and grew very rapidly. A second operation was performed in October, 1001. The disease then involved the pectoral and axillary region so widely that it was found impossible to remove it. Amputation of the upper extremity was considered, but not thought advisable. The patient was referred to me by Dr. Maurice H. Richardson in October, 1901, for the mixed toxin treatment. The toxins (prepared by Dr. B. H. Buxton) were administered five to six times a week for a period of three months, the doses being gradually increased until a reaction of 102° to 103° was produced. The tumor began to soften, and a spontaneous opening occurred in January, 1902, with evacuation of about a pint of necrosed tumor tissue. The growth had thus diminished two-thirds in size when, on February 10, 1902, I began X-ray treatment, which was continued for two weeks without any further decrease in the size of the tumor. The toxins and X-ray were then given in combination four times a week, and since that time the growth has steadily and rapidly decreased in size. One week ago the patient was able to clasp his hands behind the back for the first time in eight months. The mass in the axilla has entirely disappeared ; movements of the shoulder, which were greatly restricted, are practically normal, and there now remains only a very small, freely movable mass, not more than two inches in diameter in the pectoral region, and very superficial. This was believed to be only the induration caused by the toxin injections, and a specimen removed under cocaine on June 7th (on microscopic examination, by Dr. E. K. Dunham, Pathologist of the General Memorial Hospital), proved this supposition to be correct, as no evidence of malignancy could be found.

FIG. 6.



CASE III. Inoperable recurrent round-celled sarcoma of pectoral region and axilla. Entirely disappeared after six months' treatment with the mixed toxins of erysipelas and prodigiosus (X-ray treatment plus toxins the last three months).

The patient has remained in good health and was discharged apparently well, June 8, 1902.

As an indication of the hopelessness of this case, I will quote from a letter received from Dr. Richardson under date of May 6, 1902:

"I feel so sure that he is going to die that I have told him not to accept any discount on the face of his life insurance policy. In other words, I have not the least confidence in his ultimate cure."

Physical examination made June 27, 1902, shows the small area of induration mentioned before, and proven by the microscope to be non-malignant, to have practically disappeared. The patient is in the best of health.

CASE IV. *Round-celled Sarcoma of the Fascia of the Thigh.*—M. V., female, aged thirty-seven years, was referred to me in March, 1900, by Dr. Charles Peck, of New York. At the time of her admission to the General Memorial Hospital there was a tumor at the site of the recent cicatrix in the anterior and upper portion of the left thigh. She had had two operations at the French Hospital during the past six months, the last one, a very extensive operation, having been done six weeks before. The tumor, when I first saw her, was about three inches in diameter. Both the toxins and X-rays were tried for a month, neither having the slightest apparent effect in decreasing the size of the tumor, which was of rapid growth. The treatment was then abandoned.

CASE V. *Very Rapidly Growing Round-celled Sarcoma of the Parotid; Death Within Six Months from Date of Origin.*—B. B., aged twenty-five years; family history negative. First noticed a small swelling in the left parotid region in the latter part of September, 1901. In November, when about the size of an English walnut, the tumor was removed by Dr. Ralph Seelye, of Springfield, Mo. The last of December there was a recurrence with rapid growth. On January 15, 1902, a second operation was performed, but it was found impossible to remove the entire growth. The patient first consulted me in the early part of February, 1902. At that time there was a tumor occupying the entire region of the left parotid, firmly fixed at the base, and extending behind the tip of the ear. The patient was treated for three weeks with small doses of the mixed erysipelas toxins. At first there was a slight decrease in size and considerable diminution in pain, but after two weeks the growth increased in spite of the treatment. On February 14, Dr. W. A. Downes, my associate, tied the external carotid on the same side. This seemed to have no effect

in checking the growth of the tumor, and ten days later the X-ray treatment was begun. Only five exposures, however, were given, as the growth increased very rapidly, and the patient's general condition became very bad. His pulse was rapid and weak, and he had constant nausea and vomiting too. Neither the toxins nor the X-rays, nor the excision of the carotid seemed to have the slightest influence in checking the growth. Although further treatment was advised against, the patient was taken to another place and the X-ray treatment, with a static machine, was used for a few days. The patient died, however, within ten days after leaving my care.

Case VI. *Recurrent Melanotic Sarcoma of the Iliac Glands.*—Mrs. N., aged thirty-seven years, was first operated upon five years ago for a small sarcoma starting from the irritation of a mole in the region of the left ankle. About a year after its removal a recurrence took place in the femoral glands. I operated upon this four years ago, and three times since at intervals of about a year. At the last operation, done three months ago, I removed under ether a sarcomatous mass the size of an egg from the left femoral vein. Several other masses could be felt in the iliac fossa, but it was impossible to remove them. For the last two months the patient has had X-ray treatment three to four times a week. At present, June 4th, the patient is still under treatment three times a week. The tumor in the groin and iliac fossa have not increased any in size, and there is apparently a slight diminution. The general condition of the patient improved for a time, but at present she is losing weight slowly, and I have no hope of ultimate cure.

Case VII. *Spindle-celled Sarcoma of Upper Jaw.*—T. N., aged forty-six years, married; farmer. Family history: Great grandfather and grandfather died of cancer of the face. Uncle died of epithelioma of the lip; a cousin, of sarcoma of neck. Gonorrhœa seven years ago; no syphilis. Teeth always carious and many removed. Typhoid in 1897; pleurisy with effusion in 1892. Otherwise always healthy and strong, except for present trouble.

About January, 1899, he began to have severe frontal headaches. April 1, 1899, he noticed a smooth, somewhat painful, rapidly increasing swelling of right cheek. In June, 1899, a mass the size of a walnut was removed through the mouth, from inner side of antrum. In a few weeks the swelling returned, and in August, 1899, a large part of the superior maxilla was removed. These operations were done at Pittsburg, Pa. In January, 1900, the swelling again returned

and increased in size until he came to the Presbyterian Hospital in June, 1900. The swelling was almost painless, the size of an orange, and occupied the right side of face from orbit to floor of mouth. There was no loss of flesh or strength. The patient was operated upon by Dr. McCosh in June, 1900. The right external carotid was first tried, and then an incision made. It was found that most of the superior maxilla had been removed in previous operation. More was removed from alveolar process, and from malar bone. The tumor had infiltrated into the inner canthus of eye, and considerable tissue and bone were removed from there. The skin, which was adherent to the growth, was cut away and the wound closed after relieving the tension by incisions lower down. According to the pathological report, the disease was spindle-celled sarcoma, cells being of moderate size, with some mitosis. At the time of the patient's discharge from the hospital there was a small sinus with some purulent discharge. This closed up entirely in two weeks, and the patient had no further trouble until July, 1901, when he again began to have some uncomfortable sensation at the site of the old tumor. In the beginning of August a recurrence was noticed. This increased in size with moderate rapidity until October 1st, when the patient began to use some caustic paste. This caused a more rapid increase in size. The skin over it broke down, and there was a free air communication between the wound and the nasal passages, and a week later purulent discharge set in, which remained. The mass completely obliterated the right nasal passage, projecting into the oral cavity. Two weeks before admission to the hospital, October 5th, the patient noticed a small lump just below and to the left of the external and occipital protuberance. It has been painless, not tender, and he did not think it had grown very much. There has been no loss of flesh or strength at any time. October 19th the patient returned to the hospital with a large inoperable sarcoma at the site of the former operation, involving the whole of the right superior maxillary region and extending into the roof of the mouth and pharynx. The condition was considered inoperable by Dr. McCosh, and the patient was referred to me for the toxin treatment. He was admitted to the General Memorial Hospital, October 23, 1901, and treated with the mixed toxins for several months. At the end of the first month's treatment the improvement was very striking. The growth had decreased two-thirds in size, and the remainder was easily curetted out, leaving a clean base. For a time it seemed probable that entire

disappearance would take place, but after two months' treatment the inhibitory action of the toxins seemed to have been lost, and the growth slowly began to increase in size. February 10, 1902, the toxins were discontinued, and the X-ray treatment was tried for three weeks. In this case the X-ray seemed to have little if any effect in controlling the pain, which was gradually becoming very severe. Although the tube was placed but a short distance (not more than eight inches) from the tumor and exposures of considerable duration (ten to twelve minutes) were given, no effect upon the growth of the tumor was noticeable, and at the end of three weeks the treatment was discontinued.

CASE VIII. *Small, Round-celled Sarcoma of Gracilis Muscle, Four Times Recurrent.*—W. J. P., male; aged twenty-two years. This patient first noticed a small lump at the inner side of the left thigh one year ago. This increased slowly until July, 1901, at which time it was about the size of a hickory-nut. It was then removed by Dr. William Bull. A local recurrence followed in September, when a second operation was performed by Dr. Charles Peck, of New York. Shortly after the second operation, at the request of Drs Bull and Peck, I began the injections of the mixed toxins as a prophylactic. In spite of the treatment a recurrence followed about six weeks later, this time in the inguinal glands, and growing very rapidly. A third operation was performed by Dr. Bull on November 11, 1901. A large mass involving the inguinal glands and extending into the iliac region was removed. It was found impossible, however, to extirpate the entire amount of infected tissue. A few days later I began the injections, using fresh bouillon cultures of virulent streptococcus of erysipelas in order to produce an attack of erysipelas. Moderate reactions were obtained, the highest temperature being 103°. After three weeks' treatment with the living cultures the toxins were resumed in doses of five to seven minims. This treatment was kept up for eight weeks, the patient being able to get about most of the time and attend to his business. No recurrence followed until thirteen weeks later, when a small nodule, deeply situated, about the size of a hazelnut, appeared at the site of the original operation, at the inner side of the thigh. The X-ray treatment was then begun, and has been continued since with exposures of ten to fifteen minutes in length, a German tube with a high vacuum being used. The first month's treatment showed the growth apparently not increasing in

size, although it was not perceptibly smaller. At the end of this time small doses of the toxins were given in conjunction with the X-ray treatment. Whether or not influenced by the toxins, it is impossible to say, but for the first time the growth showed a decided decrease. After remaining quiescent, neither increasing nor decreasing for about a month, the growth has since the last three weeks again begun to slowly increase in size in spite of the X-ray treatment, which has been given six times a week. On June 3, 1902, under ether, I removed the tumor, the size of a small hen's egg, deeply placed beneath the adductor muscles and beneath the femoral vein, about three inches below the insertion of the adductor tendon. Its deep situation probably explains the slight action of the X-rays. The report of the microscopic examination by Dr. George P. Biggs, Pathologist to the New York Hospital, reads as follows :

"It is very difficult to make comparison between the slides from old and recent operations in this case. In the first place, there is but one slide from the older operation, and the section on it is rather thick. As to how well it represents the general structure of the whole tumor, might be questioned. While there appear to be some differences in structure, I would not make any positive statements on this point, and certainly would not ascribe them to the use of the X-ray without confirmation in other cases. Section from the older tumor shows a larger percentage of small cells and less fibrous tissue than the later tumor. There are several giant cells in the later tumor, and apparently none in the older. Intercellular substance, partly homogeneous and partly fibrillary, is more abundant in the later tumor. Both are quite vascular, and in both there are areas of necrobiosis. Neither are typical illustrations of small round-celled sarcoma, but the older tumor is very probably placed in this class."

It is worthy of note that the sarcomatous disease left in the inguinal and iliac regions at the time of the last operation apparently disappeared under the influence of the living cultures and the toxin treatment, and, although the groin has not been subjected to the X-ray treatment, no recurrence has been noticed in this region.

Later History, September 30, 1902. In spite of X-ray treatment following this last operation there was local recurrence in August, and at present there is evidence pointing to metastasis in the lungs.

Case IX. *Small Round-celled Sarcoma of the Back.*—W. I., aged eight years ; family history good. In the latter part of August, 1901, the patient fell from the stoop, striking the back. Two or

three weeks later the mother noticed a swelling over the left scapular region which increased in size rather rapidly. It was soft and fluctuating from the start. The patient was referred to me December 23, 1901, by Dr. Polhemus, of Nyack, New York. Physical examination at that time showed a cystic swelling the size of an orange in the left scapular region. The skin was normal, the tumor fluctuating, situated apparently just beneath the skin and superficial fascia. The diagnosis of hæmatoma was made, and on January 12th an incision was made under ether anæsthesia. Several ounces of dark blood were evacuated. There was no evidence of any tumor at this time. The wound was closed without drainage, and healed by primary union. Two to three weeks later the tumor slowly began to reform; it was still cystic in character and increased steadily in size until, on May 6th, it had become about one-third larger than prior to the first operation. A second operation was performed. This time, in addition to fluid blood and clots, there was a slight thickening of the walls of the cyst, which made me suspect sarcoma. A portion of this thickened tissue was removed and examined by Dr. H. T. Brooks, Professor of Pathology, of the Post-Graduate Hospital, who pronounced it a small, round-celled sarcoma of high vascularity.

Two weeks after the operation, before the wound had entirely healed, the X-ray treatment was begun, and at present the patient has had ten exposures. There has been no increase in size, but it is impossible to say as yet whether there has been any decrease. The area is so extensive that it would be almost impossible to remove the entire base successfully by operation.

Later History, June 21, 1892. The condition at present shows decided improvement. September 20, 1902. The treatment has been continued with less frequency until now, and there is no evidence of any tumor present. The back is perfectly normal.

Case X. *Inoperable Sarcoma of the Parotid.*—M. H., female, aged fifty-seven years; family history good. Seventeen years ago first noticed a small lump, the size of a pea, in the region of the left parotid gland. This grew very slowly until about a year ago, when it increased in size more rapidly. In May, 1901, it had attained the size of an orange, and was operated upon by Dr. W. C. Wood at the Brooklyn Hospital. The tumor was supposed to have been entirely removed. There was a recurrence in August, and a second operation was performed in January, 1902; it was impossible to remove all of the disease at this time, and growth was very rapid after operation.

Physical examination April 18, 1902, showed the woman in good general condition. In the left parotid region there was a tumor, the size of a fist, irregular, protuberant, and ulcerated in several places, extending from the orbit to below the ramus of the jaw, and from the left ala of the nose to a short distance behind her ear. The ulcerated areas have a tendency to bleed easily.

The patient has had six weeks' treatment with the X-ray at the General Memorial Hospital, here, four times a week, the exposures being given at a distance of six to eight inches and of ten to twelve minutes' duration. At first a great deal of the tumor sloughed off. The pain decreased, and while the tumor mass is still large, it is steadily decreasing, and the vascularity has greatly diminished.

Later History, June 21, 1902. The growth has shown slight increase at the lower portion, beneath the jaw. The mixed toxins were begun June 19th, in addition to the X-ray treatment. In spite of this combined treatment the patient showed no further improvement, and left the hospital the latter part of July.

In addition to these cases I have watched with great interest four patients with inoperable sarcoma who had been for a long time under my observation and on whom the toxins of erysipelas had been carefully tried, but without success, and who were later treated with the X-ray by other men. A brief history of these cases follows:

CASE I. *Small Round-celled Sarcoma of the Neck, Six Times Recurrent.*—G. F. H., aged seventy years. About thirteen years ago a lump was first noticed in the left side of the neck. Nine years ago this was removed at the New York Hospital. The tumor recurred one year later in the scar, and grew much larger. The patient had had four subsequent operations within the last seven years. One tumor was removed from the right side of the neck, the others recurring in the region of the cicatrix of the original growth on the left side and behind the ear. The pathological records of the New York Hospital show the following:

"February 21, 1892. G. F. H., aged sixty years, has had a tumor on the left side of the neck, posterior to the scalenus anticus muscle, for three years and four months. Of slow growth at first, the tumor has increased in size rapidly during the last three months. No glands were involved. Operation February 20, 1892. The speciman is an oval

tumor, 7 by 4½ inches; no capsule; on surface the voluntary muscle fibres are seen invaded by the tumor tissue at several points. Microscopically the tumor is a typical round-celled sarcoma with small amount of fibrous tissue stroma, apparently derived from tissues in which the growth originated."

On May 13, 1901, the patient was referred to me by Dr. E. M. Foote, of the Vanderbilt Clinic, as a case of inoperable sarcoma of the neck, for treatment with the erysipelas toxins.

Physical examination at that time showed a tumor the size of an orange occupying the left mastoid region. The tumor was very vascular and semifluctuating. There was a glandular involvement behind the jaw on the right side; also a growth the size of a small orange in the right femoral region. There was a hard, freely movable glandular tumor in the right axilla the size of an English walnut. The patient was treated with the mixed toxins of erysipelas and bacillus prodigiosus from May 13th to June 5th, during which time thirteen injections were given, the highest temperature reached being 102°. On June 5th I tied the external carotid artery on the left side, under ether anæsthesia, using chromicized tendon for the ligature. The wound healed by primary union, and the patient then left the hospital, but returned July 16th for another course of the toxin treatment, and remained until July 27th—eleven days. At first there was some slight improvement following the injections of the mixed toxins, but later on there seemed to be very little, if any, influence from the treatment. The patient seemed to become rather tired of hospital life, and was discouraged. He returned home on the 27th of July, the tumor at that time being about the same size as when he entered the hospital, the base occupying the mastoid region and extending down to the neck, pushing the ear forward. It was not attached to the bone, but was absolutely inoperable, and, as I believed, hopeless.

December 22, 1901, Dr. E. R. Fiske, of Brooklyn, started the X-ray treatment. The patient states that he had been trying for several months to find a physician or surgeon to give him the X-ray treatment, but failed until Dr. Fiske took him in charge, offering to give him two weeks' trial, but holding out very little hope as to the result. A static machine was used, and exposures of ten minutes' duration each day was made for two weeks, when the treatment was continued for two weeks further, the exposures being made for fifteen minutes. At the end of four weeks' time the exposures were

lengthened to twenty minutes. In all, the patient had six weeks' treatment. His condition at the time of the beginning of the treatment was as follows: On the left side of the neck, just behind the ear and extending downward, was a large tumor, fully the size of two fists, pushing the ear far forward. There was also in the right axillary region a tumor the size of a goose egg. Almost immediate improvement was noticed after the beginning of the treatment, and the mass rapidly diminished in size; at the end of four weeks it had entirely disappeared. The patient states that after three to four weeks of X-ray treatment he noticed a softening of the tumor in the right axilla, although no other exposures were made in any other region except the neck. This softening continued, and the tumor gradually disappeared until February 20, 1902, it could scarcely be felt. At the X-ray meeting of the Academy of Medicine, March 9, 1902, I showed the patient in perfect health, and there was not the slightest suspicion of tumor or induration in the neck. The tumor in the right axilla had also disappeared. On June 19, 1902, I made a careful examination of the patient, and there is no trace of a recurrence. Since April, 1902, he has had X-ray treatment for nodules in both groins (size of an egg), and they have disappeared from left groin, and nearly disappeared from right.

This case is certainly one of the most remarkable of its kind yet recorded, showing the beneficial influence of X-rays upon sarcoma. The repeated recurrences, together with the numerous microscopic examinations at the New York Hospital, place the diagnosis absolutely beyond a doubt.

Later History. I examined the patient personally in July, 1902, and there was no local recurrence. He was being treated by Dr. Fiske for the enlargement in the inguinal glands, which was subsiding.

Case II. *Spindle-celled Sarcoma of the Abdominal Wall.*—M. J. H., female, aged thirty-four years, was referred to me by Dr. Maurice H. Richardson, of Boston, on April 19, 1901. The patient had a well-marked family history of malignant disease. She had been operated upon three years before for what was regarded as a fibroid tumor of the uterus; the tubes and ovaries also were removed. No microscopic examination was made. Two months ago she first noticed a hard tumor in the lower part of the abdominal wall, in the region of the cicatrix. There was no pain, no discomfort, but rapid increase in size. When the patient came under my care, physical examination showed a tumor the size of a cocoanut in the lower part

of the abdomen, filling up the entire iliac fossa, extending nearly to the umbilicus, and two inches beyond the median line to the left. The tumor was very firmly fixed, and seemed to involve the abdominal wall. An incision was made under cocaine, and a portion of the growth which infiltrated all the muscles of the abdominal wall was removed for microscopic examination, which showed it to be a fibrosarcoma. The erysipelas toxins were used for ten months. During the first two months the growth decreased more than half in size, and for a long time thereafter, while there was no decrease, there was no distinct growth. Later on the influence of the toxins seemed to have become lost, and there was a slow but gradual increase in size. In January, 1902, the tumor was growing rapidly, and at this time the abdomen had the appearance of that of a woman seven months pregnant. I advised a trial with the X-rays, and the patient went to New Haven, Conn., where she has since been under the care of Dr. Clarence Skinner and has had regular, systematic treatment. Dr. C. A. Bevan, of New Haven, with whom she is staying, in a letter sent me about a month after the treatment was begun, stated that her general condition had become very greatly improved. I examined the patient about the middle of May, and while her general condition was much improved, no decrease in the size of the tumor was noticeable; in fact, it seemed to have slightly increased. I do not believe a cure possible.

Later History, June 20, 1902. I have just learned that her general condition is getting worse, and that she is losing weight. Her symptoms attributed to malaria are more probably due to absorption from the tumor.

Case III. *Recurrent Small Round-celled Sarcoma of the Superior Maxilla.*—W. D., aged thirty-eight years, a dentist, was operated upon by Dr. William T. Bull in the spring of 1901 for small round-celled sarcoma of the superior maxilla, with excision of the entire bone, with exception of the orbital plate. The growth promptly recurred and three secondary operations were performed by Dr. Bull, and myself, the last one in August, 1901. The patient was treated with the mixed toxins of erysipelas and bacillus prodigiosus for several months, by Dr. Gertrude Kelly, under my direction, with temporary improvement and some decrease in the size of the tumor. But at length the toxins seemed to have no further effect, and an attempt was made to produce erysipelas by inoculating living erysipelas cultures. A slight attack was produced, with much im-

provement in the condition of the growth. Soon, however, the tumor began to grow rapidly and involved a large portion of the cheek and nose, causing exophthalmos of the left eye. Feeling sure that nothing further could be done, either by the operation or the toxins, I referred the patient to Dr. W. B. Snow, of New York, in the latter part of January, 1902, for the X-ray treatment. Dr. Snow has treated him three to four times a week ever since, with a twelve-plate static machine, and the growth has not only been checked, but has diminished very markedly since. At present there is still some exophthalmos, a considerable portion of the tumor remaining, but it is not more than one-quarter of its original size, and is still improving.

With the deep extension of the disease behind the orbit and into the nasopharynx, and in all probability into the frontal sinus, I do not believe complete recovery possible, yet the fact remains that in a most unpromising case of highly malignant round-celled osteosarcoma the disease has been largely destroyed and the growth greatly inhibited for several months.

Later History, September 30, 1902. While the external portions of the growth have been nearly destroyed by the X-ray, the tumor has advanced in the deeper portions, and the patient is losing ground.

Case IV. *Recurrent Osteosarcoma of Side of Head, Mastoid Region, and Parotid.*—S. M., female, aged twenty-two years. Four years ago she first noticed a tumor just in front of the right ear. This was excised, but was followed by a recurrence a year later. The recurrent growth was treated with caustics, without success. The patient was referred to me for the toxin treatment by Dr. Kinnaird, of Lexington, Ky., in October, 1900. Physical examination at that time showed a tumor involving the mastoid region of the temporal bone, completely surrounding the ear and forming a mass, the size of an English walnut, in the parotid region. The growth originated in the bone, and was absolutely fixed; the skin over the parotid portion was normal and not adherent. The posterior tumor projected to the level of the ear, and the skin was involved and destroyed, being replaced by a series of hard, small, round, reddish protuberances, with little tendency to ulceration. The tumor was unquestionably a sarcoma, although no microscopic examination was made. The patient suffered agonizing pain, for which large doses of morphine were required. She had lost much flesh and strength, and her pulse ranged between 100 and 120. The toxins were given for three months, but her condition was so poor that she was never able to

receive more than one-fifth to one-third of a drop injected into the tumor. Even these small doses produced some decrease in the size of the growth and slight improvement in her general condition. At the end of three months she returned home, and the treatment was continued for three months by her family physician. After the treatment was discontinued the tumor began slowly to increase in size, and she returned to New York for further treatment in November, 1900. The tumor had increased considerably in size, the mass behind the ear being the size of a hen's egg, and the mass in front nearly as large, although the skin was normal. It presented the appearance of a uniform, cone-like bulging of the entire side of the head, the external auditory meatus of the ear occupying the apex of the cone. The tumor was extremely sensitive to the touch, and the pain was more severe than the year before, requiring one-half grain of morphine every two hours to give her moderate relief. She was still much emaciated, pulse was weak and rapid (110 to 120 per minute). Her susceptibility to the toxins was still marked; a dose of not more than one-quarter mm. would produce a severe chill and a temperature of 102°–103°, and marked prostration. She was treated with minute doses (one-fifth drop) four times a week, for three months, up to the middle of January. While there was apparently no increase in growth there was no decided decrease, and inasmuch as it was impossible to give her larger doses, I believed it useless to continue the treatment. Having carefully followed the results obtained by the X-ray treatment in epithelioma, and a few cases of carcinomatous nodules in the breast, I thought it worth while to try the effects of the X-ray treatment before abandoning the case as hopeless, and accordingly referred the patient to Dr. William J. Morton, January 25, 1902. Since then she has been treated four times a week by Dr. Morton, with a twelve-inch coil, ten to twelve minutes' exposure, at a distance of eight to ten inches. The immediate effect of the treatment was a marked influence upon the pain, which ceased almost entirely after three to four treatments, and there has been very little pain since, making it possible for her to nearly discontinue her morphine. The effect upon the tumor was an almost immediate diminution in size, and this has been constant ever since. There has been no breaking down or necrosis, but a steady disappearance by absorption. Physical examination on May 18, 1902, showed the tumor to have almost entirely disappeared, at least the protuberant portion. Very little difference could be noticed between the two sides of the face

and head. The patient has gained some in weight, and looks greatly improved in general health.

June 16th. About a week ago the patient began to have more pain in the cervical region, with slowly increasing swelling and tenderness. Within the last ten days she has lost several pounds in weight, and has developed marked weakness and prostration. There has been considerable discharge from the ear, and the cellulitis of the neck has probably been caused by infection from the broken-down tumor tissue. There has been no apparent increase in the size of the tumor, but the patient's general condition is so bad that I do not believe recovery probable.

On June 22, under ethyl chloride anæsthesia, I incised the neck, evacuating several drachms of thick, foul pus. With free irrigation with peroxide the discharge from neck and ear decreased rapidly, and on July 1st the patient's general condition had improved sufficiently to permit removal to her home in the South.

Later History. In a letter from her father, dated September 23, 1902, he stated that her condition was not so good, that the pain had come back, and that she was growing weaker.

While none of these cases can as yet be reported as a cure, they nevertheless furnish the strongest ground for encouragement. It seems proved that in a certain portion of malignant tumors we have found an agent that will cause the disappearance of the growth after all other means have failed. Whether the patients will remain well sufficiently long to justify us in calling them cured, time alone will tell. The entire disappearance of a large tumor of the neck in four patients: Skinner's (of New Haven), Pusey's (of Chicago), Fiske's (of Brooklyn), the diagnosis of sarcoma being confirmed in every case by competent pathologists, together with my own case of much more extensive round-celled sarcoma of both sides of neck, clavicular and axillary regions, give us great cause for congratulation. When we consider how large a proportion of sarcomas have their origin in the neck, and how hopeless they have proved to operative treatment, we realize the importance of these recent observations.

In my collection of 207 personal cases of sarcoma analyzed in the *Twentieth Century Practice of Medicine*, 1897, no less than

sixteen cases were primary in the neck. I have never yet seen a case of sarcoma of the neck cured by operation, nor have I been able to find an authentic case reported by other surgeons; hence, if in the X-ray we have a means of destroying these growths or a certain portion of them, it means a great advance over present methods.

As regards the action of the X-ray, no one has yet been able to explain just how the X-ray influences malignant tumors. There have been a great many opinions advanced, but none is susceptible of proof. Pusey states that his "sections show that the X-rays cause a degeneration of some sort, of carcinomatous tissue, and a disappearance of this degenerated substance, presumably by absorption. However it occurs, the fact remains that gross embryonic tissues and other tissues of low vitality are made to disappear under the influence of X-rays, without destruction of the uninvaded healthy tissue, and such a fact is pregnant with possibilities."

Personally, I believe that there are strong reasons for regarding the action of the X-rays upon malignant tumors as new evidence in favor of the microparasitic origin of such tumors. In support of this view I would cite the fact that nearly all lesions in which the X-ray has been used with such beneficial effect are of known or probable microbic origin, *e. g.*, lupus, tuberculous disease of various forms, and many varieties of skin disease, including alopecia areata. It will be objected by some that the X-rays are not bactericidal or to only a slight degree. The answer would be that the action of the X-ray in a test-tube culture of a given germ might be of a very different kind from the action of the same rays in the living body, with the possibility of forming some chemical change in the living tissues that might destroy the organisms or inhibit their growth.

It is worthy of note that in the two cases in which the tumors (both large, inoperable round celled sarcomas) have almost completely disappeared, the patients have been treated with the mixed toxins of erysipelas and bacillus prodigiosus for several months. In one case the tumor had diminished at least one-half in size as a result of the toxins, and then showed

little improvement from the X-ray alone, and in the other, while the growth was not checked entirely the toxin treatment had a marked inhibitory action, as evidenced by the slower progress of the disease.

Proper Limits of the X-ray Treatment.—The question will naturally arise: In what class of cases should the treatment be employed? We must confess that the method is still in the experimental stage, and while in this stage I do not believe it wise to employ it except in inoperable cases or in cases in which serious deformity would result from the operation, *e. g.*, facial cancer, or cancer involving the eyelid or nose. There is, however, a possibility that if the present results prove permanent it will supersede operative treatment in very many cases, especially cases in which operation would necessitate the amputation of a limb.

Conclusions: I am conscious that the present series of cases is too small, and the time of observation too short to justify one in drawing any dogmatic conclusions as to the permanent therapeutic value of the Roentgen ray in sarcoma. Still, I believe we are warranted in stating:

1. That the results in the cases thus far treated prove that the Roentgen ray has a remarkable inhibitory action upon the growth of all forms of malignant disease, and this is especially true of sarcoma.

2. That this action in many cases of even far advanced and inoperable malignant disease may result in the total disappearance of the tumors, often without any breaking down of the tissues, the new-growth being apparently absorbed.

3. Whether the patients have been cured or the disease has been merely arrested, to reappear at some future date, is a question that time alone can decide.

4. Recent observations and experiments upon the various forms of carcinoma and sarcoma prove that an agent supposed to be of value only in a very limited class of superficial epitheliomas promises to be of as great or greater value in practically every variety of inoperable cancer.

5. While at present there is little evidence to show that deep-

seated tumors in the abdomen and pelvis can be cured or benefited by the Roentgen ray, there is still some reason to hope that with improved apparatus, or with greater knowledge and skill in using the apparatus that we now have, even these cases may be benefited.

6. The Roentgen ray has a very marked influence upon the pain of nearly all types of malignant tumors, causing entire relief in the many cases.

DISCUSSION.

Dr. William H. Carmalt, of New Haven, Conn.

I wish Dr. Coley would leave out all reference to the case in New Haven.

Dr. M. H. Richardson, of Boston.

Dr. Coley's efforts to find a cure for malignant disease should meet, it seems to me, with the greatest encouragement. Though the majority of my cases have failed to be cured by his methods, yet there have been two cases so remarkable that it seems not unreasonable to hope that something may be accomplished along these lines, especially in the inoperable and hitherto hopeless cases.

In two cases, as I say, the cure has been so extraordinary that the results can be rejected only by attacking the diagnosis. In attacking the diagnosis the clinical evidence of experienced observers must be excluded, as well as the microscopic evidence of skilled pathologists. Though I freely admit the possibility of error, both by clinician and by microscopist, yet I must maintain that in these two cases the type of malignancy was characteristic and convincing. Moreover, the microscopic reports, especially in the second case, were not in the least doubtful. In the second case Dr. Whitney submitted, after each operation, precisely the same report of a small round-celled sarcoma.

The first case was a large fibrosarcoma of the abdominal wall, which utterly disappeared after a few months' treatment. The second case was that of a young man with a small tumor at the axillary border of the pectoralis major. This tumor I saw first on December 23, 1898, and advised excision. The patient did not submit to operation, but came to see me two years later, when I found a great increase in the size of the tumor, with secondary metastases filling the axilla. Operation was thorough and extensive. On December 12, 1901, a second operation was performed for extensive recurrence. *It was impossible to remove the disease.* Hemorrhage was considerable from the masses which everywhere infiltrated the tissues about the axilla and shoulder. I advised, as the only possible course and the most hopeful, removal of the whole upper extremity. Declining this, the patient could take the Coley treatment under Coley's own supervision. Fortunately, he chose the latter course.

Some months after he first came under Dr. Coley's treatment I examined him, and found, in addition to the signs in the axillary region,

several lymph nodes above the left clavicle. Death in the near future seemed to me to be inevitable. I understand now, from Dr. Coley and from his patient, that he is cured. I have recently examined the man. He is in splendid health. There is not a sign of disease, either in the region of the operation scar or above the clavicle. I call him, as I say, perfectly well.

If in cases of this kind we must reject that evidence upon which the diagnosis of a tumor depends, we must, as I say, doubt the clinician, the pathologist, and the microscopist. If we do refuse to admit that Coley has in these two cases cured malignant disease, then we may as well, on like grounds, reject all alleged cures. Such a course, far from encouraging renewed efforts in this direction, will discourage them. If, before trying a new method we must wait until all cases are by that method cured or at least benefited, then we must wait indefinitely.

The beneficent results are, I admit, only occasional. I would in every operable case wait until operative treatment had been exhausted.

In cancer I have seen no cure by Coley's method. In one instance life has been prolonged since 1896. At that time, soon after amputation of both breasts, nodules of cancer began to spread from the scar around the thorax—the *cuirass* cancer. By the Coley treatment this process was not only arrested, but for several years it entirely disappeared. The patient is, however, now dying of abdominal cancer.

Dr. A. J. Ochsner, of Chicago.

Two of the cases mentioned by Dr. Coley were referred by me to Dr. Pusey, and the one with sarcoma of the neck had it on each side. I had removed the sarcoma on one side of the neck by a careful dissection. Just at this time Dr. Pusey was starting with his work, and while the patient was gaining sufficient strength to have the operation upon the other side I sent him to Dr. Pusey. Before this was accomplished the sarcoma on the other side had disappeared. I could not question the diagnosis, which was confirmed by Professor Zeit, who examined microscopically the part I removed. In this case there has been a recurrence. The day before I left home Dr. Pusey told me that his patient had returned to him for treatment some weeks ago, and that on his (Pusey's) side there had been but a slight recurrence, while on my side there had been considerable. Both have disappeared again under the X-ray treatment. The case of sarcoma of the shoulder mentioned in the paper was an absolutely hopeless one, the

man having sarcoma of both the shoulder and bladder. The case was sent to Dr. Pusey to secure some relief from the pain, which was accomplished. There was absolutely no chance of recovery in this patient, as there were undoubtedly many other metastatic foci when the patient began the use of the X-ray. As soon as his pain was somewhat relieved he returned to his home.

Dr. Arpad G. Gerster, of New York City.

I believe that every surgeon before the time of the serum treatment and before the time of the X-ray treatment has seen so called sarcomata disappear. As old a surgical author as Esmarch has recorded a number of cases of this kind. The iodide of potash has been claimed to do good in sarcomata, and I have seen a large number of cases that have been presented to me as cured. I believe one really was cured. I do not wish to be looked upon as depreciating the efforts of surgeons to relieve suffering, and I am fully in sympathy with this tendency, but I beg to call attention to the fact that many of these new propositions have a likeness to the new projectile. After a while we shall know more about these remarkable cures. We do not know anything about the subject, and I would rather call up the critical faculties of the surgeon before accepting this statement. It is rational and inexpedient. Such observations have been seen and recorded by good surgeons long before our day, but the results are far from what should be called a cure, and the vast proportion of them ultimately succumb. The chief error is produced by the fact that we trust too much to the microscope, and we have been accustomed to accept too blindly the statement of the pathologist. Do not forget that certain forms of syphilis are just as disagreeable, just as deceptive, and just as difficult to diagnose as anything we know of. It will relapse after excision just like a sarcoma, and a section of it under the microscope looks very much like sarcoma. High as are the achievements of pathology, there is still much to learn.

Dr. Theodore A. McGraw, of Detroit, Mich.

My experience has been quite limited, but I have had several cases of recurrent sarcoma which have been very much improved by the X-ray. I do not look upon these cases as cures, and I do not think Dr. Coley believes they were cured, but we will have cases of this kind if we only pay attention to them. I had a patient last winter with spindle-celled sarcoma whom I sent to the X-ray department, and he

came back with a very much diminished tumor. This encouraged me, and I feel that when these patients come to us with this dreadful disease we should be induced to try everything that could possibly give relief.

Dr. Coley.—I am sorry that I did not have time to give an abstract of the cases I reported. There is certainly something besides happy chance that causes these tumors to disappear. I doubt not that a careful review of the entire medical literature will enable one to find an occasional case that has been diagnosed as sarcoma, usually without the confirmation of the pathologist, that has disappeared spontaneously, but it is very different in the present series of cases. If in a large series of cases in which the toxins or the X-rays have been used the tumor disappears coincidently with the beginning of the treatment, there must be something more than chance. I do not know whether these cases reported to-day are cured or not. I have simply stated the fact that they have shown remarkable improvement, and in some instances entire disappearance during the treatment.

As to the mixed toxins I presented before the Association last year —a report of sixteen cases of inoperable sarcoma that had remained well from three to eight years—and in all of these cases, with two exceptions, the clinical diagnosis was confirmed by a microscopic examination made by competent pathologists. Since that paper was read I have shown before the New York Surgical Society a patient with inoperable round-celled sarcoma of the parotid gland which had disappeared entirely under eight months' treatment with the erysipelas toxins, and there has been no return to date—more than one year since. In this case the tumor had speedily recurred after operation, and was considered inoperable by Dr. William T. Bull, who referred the patient to me for the toxin treatment. A most careful examination of the specimen was made by no less an authority than Professor William H. Welch, of Johns Hopkins University, who pronounced it undoubtedly sarcoma of the small round-celled type.

We should try, I think, any method that will cause these inoperable malignant tumors to disappear, and if the patient continues well for several years we are justified in calling them cured. At any rate, these cases should be judged by the same standards as those treated by the knife, and if we claim that the cases that are cured by the toxins or the X-rays are mistaken diagnoses, we are logically driven to the same explanation in the cases that are cured by operation.

THE "CIRCULUS VITIOSUS" FOLLOWING GASTRO-ENTEROSTOMY:

With a Description of a New Operation Designed to Prevent its Occurrence.

BY GEORGE RYERSON FOWLER M.D.,
BROOKLYN.

The occurrence of vomiting following gastro-enterostomy is always a source of anxiety to the surgeon, for it suggests to him the advent of that most unfortunate condition known as "the vicious circle." The indiscriminate use of the latter term, however, is to be deprecated, since, though vicious it may be, the "circle" is not always present. The term regurgitation, or, better still, reflux, is much to be preferred in indicating the passage of bile and pancreatic secretion, as well as that of the contents of the jejunum, into the stomach. The term vicious circle, if employed at all, should be restricted to those cases in which the stomach contents pass into the afferent or duodenal side of the loop of intestine forming the gastro-enterostomy, and are subsequently returned to the stomach mixed with the secretions from the duodenum, these including bile and pancreatic juice. In the remaining cases, namely, first those in which the secretions alone pass from the afferent limb of the loop backward through the still more or less permeable pylorus, as, for instance, in those cases in which the operation is performed for non-carcinomatous stenosis, gastroptosis, and dilatation of the stomach, the last-named two of which, according to Yersin, depend upon marked alterations of the pylorus; second, those in which the bile and pancreatic juice pass through the afferent portion of the loop; and third, cases in which the jejunal con-

tents are forced into the stomach through retroperistaltic movements in the efferent portion of the loop or by means of mechanical pressure during acts of vomiting. In all of these the term "reflux" is more applicable.

An essential feature of the original operation of gastro-enterostomy as applied by Billroth in connection with resection of the pylorus (Fig. 1), as well as in that of Wölfler's first method, is the passage of the contents of the duodenum into the stomach from the efferent loop, thence mingled with the stomach contents, passing into the efferent portion of the loop. It is likewise an essential feature of Von Hacker's posterior gastro-enterostomy (Fig. 2). Wöfler, realizing that no dependence could be placed upon the invariable passage of the gastric contents into the efferent portion of the loop, and in order to prevent the occurrence of the vicious circle, divided the jejunum and implanted the end of the efferent portion into the previously incised stomach wall, and the end of the afferent portion into the efferent portion (Fig. 3).

Luecke, in attempting to overcome the evils arising from retroperistaltic jejunal reflux, proposed to so arrange the loop of intestine employed for the gastro-enterostomy as to secure peristalsis on the part of the stomach and of the efferent portion of the loop in the same direction. This necessitated crossing the two legs of the loop (Fig. 4), itself a dangerous procedure as shown by McGraw.[1] In this operation of Luecke's no provision is made for preventing duodenal reflux, an omission of comparatively slight importance so long as the contents of the duodenum find their way out of the stomach again with readiness, since the passage of bile and pancreatic secretion from the duodenum into the stomach without doubt takes place under circumstances of absence of disease of the latter, without serious inconvenience, as, for instance, during attacks of nausea and vomiting, these being either promptly vomited or returned to the duodenum. Under conditions of gastro-enterostomy for pyloric carcinoma, however, the obstruction at the pylorus pre-

[1] American Medicine, vol. ii. p. 217.

FIG. 1.

Billroth's original method of gastro-enterostomy.

FIG. 2.

Von Hacker's posterior gastro-enterostomy.

FIG. 3.

Wölfler's method of gastro-enterostomy.

FIG. 4.

Luecke's operation of gastro-enterostomy.

vents return to the duodenum by the usual route, even should the motor function of the stomach, impaired to some extent by the operation itself, be sufficient to accomplish this. The latter, likewise, interferes with its prompt evacuation by vomiting.

Chlumski's[1] observations carried on in twenty-one cases found that pure circulus vitiosus occurred but once. An analogous condition was, however, noted in five cases. In one of these the portion of intestine leading from the anastomosis was compressed by adhesions and a bridle of omentum; in the second, there was a stricture of the transverse colon; in two others there was axis torsion of the attached loop of intestine, one of which recovered after entero-enterostomy. In the fifth case gastro-enterostomy had been performed for excessive and persistent vomiting. The cause of vomiting was not apparent, and after the operation the symptoms persisted. The autopsy revealed tubercular ulcer of the duodenum, with stenosis and typical ileus, the latter of which was probably postoperative, and not explained by the author. Neither is the site of the ulcer and stenosis given. It is interesting in this connection, however, to note that experiments upon animals, and a case occurring in man, observed by Lederhose, tend to show that stricture opposite the ampulla of Vater does not cause vomiting. Chlumski finally decided that the postoperative symptoms were caused by intestinal paralysis, and cites a case by Werth (1899), in which the same symptoms occurred following the operation, and in which neither adhesions nor other cause of obstruction was found.

In experiments conducted upon dogs by Chlumski an attempt was made to imitate the vicious circle by compelling the bile and pancreatic secretion to flow into the stomach, and at the same time providing for its exit through a gastro-enterostomy. This was done by dividing a loop of jejunum and implanting the afferent end into the anterior wall of the stomach. The efferent loop was likewise implanted into the stomach wall. By this means the bile and pancreatic juice were carried into the

[1] Burns. Beiträge zur klin. Chirurgie, 1900, xxvii.

stomach by the afferent loop, and then in part were returned to the same loop by way of the pylorus, the remainder entering the efferent loop, which was intended to receive the contents of the stomach. The animals all died, the most striking symptoms being great thirst and diminished appetite.

Stendel repeated the experiments of Chlumski, one of his animals surviving eighteen days, and then dying of perforative peritonitis the result of giving way of a suture. The technique of Stendel differed, however, from that of Chlumski in that the former occluded the afferent end of the divided duodenum and implanted only the efferent end into the stomach (see Kelling's experiments).

As there were some discrepancies between the results obtained by Chlumski and Stendel, the former repeated Stendel's experiments upon two dogs, with the result that both animals died with the same symptoms as those in his own original experiments. Chlumski then operated upon a third dog as follows: The jejunum was divided close to the duodenum, the central end closed by Doyen's method (purse-string suture and inversion of the ends). The efferent portion was then united to the anterior wall of the stomach by a Murphy button. The only symptom which followed the operation was great thirst, which finally disappeared. At the end of four weeks the animal was entirely well.

The only essential difference between this technique and that of Stendel consists in the amount of efferent portion of the intestinal loop left in which stomach and duodenal contents could accumulate. It is likewise difficult to reconcile the results obtained by Stendel, as well as Chlumski, when he employed his later technique, with those obtained by Kelling. Chlumski, however, explains the difference in the results between his own original experiments and those obtained by Stendel as follows: In the former bile and pancreatic juice flowed constantly into the stomach, and either caused functional disturbances or were themselves destroyed by the gastric juice, with an invariably fatal result. In Stendel's operation, however, the bile and pancreatic juice collected in the duodenum, where they were

retained for a considerable length of time. Following the completion of gastric digestion, the duodenum became so distended that the pylorus opened and allowed the fluids to enter the stomach, where there was not enough gastric juice to destroy them, nor could they interfere with gastric digestion.

Chlumski's explanation of the results obtained by Stendel's operation is borne out by the following case of duodenal obstruction below Vater's ampulla coming under my own observation:

M. B., aged seventy-four years, was admitted to the Methodist Episcopal Hospital with a history of obscure dyspeptic symptoms for one year, and of progressive emaciation for nine months. During the past three weeks a striking feature of the case was the occurrence of vomiting at intervals of forty-eight hours, the amount of vomited material apparently exceeding that of the food (which was exclusively liquid) taken during that time. This vomited material contained bile as well, showing that, in addition to the liquid food taken and which had remained in the stomach, a reflux of the duodenal contents had taken place. During the intervals between the attacks of vomiting no special symptoms were noticeable attributable to the presence of the ingesta save that, as the patient expressed it, the latter "lay heavy on his stomach" after two or three meals had been taken. This was relieved by emptying the stomach and did not return until more food had been taken, when, at the end of another forty-eight hours, the process of emptying the stomach was repeated. A fixed tumor was easily made out just above the umbilicus. Operation disclosed a retroperitoneal growth which completely occluded the duodenum below the ampulla of Vater. Marked gastrectasis was present.

A case similar to the above is referred to by Chlumski as coming under the observation of Lederhose.

The experiments of Kelling[1] are of interest in this connection. This observer, upon the basis of experiments upon dogs, confirmed the announcement made by Hirsch in 1892, and von Mering in 1897, that filling of the duodenum inhibited the contractions of the stomach. Kelling, in order to determine the

[1] Archiv für klin. Chir., 1890, vol. lxii., Nos. 1 and 2.

bearing of these observations upon gastro-enterostomy, divided the jejunum and made an anastomosis between the efferent end and the stomach, suturing the afferent end so as to form a blind pouch. He found that the food passed through the pylorus until the duodenum became filled, when the gastric contractions ceased, and the dog died of starvation, in spite of the gastro-enterostomy.

The occurrence of vomiting following gastro-enterostomy, whether from the anæsthetic or from the presence of bile and pancreatic secretion, forces an increased amount of duodenal contents, and the contents of the jejunum as well, into the stomach. This occurs as a result of mechanical pressure of the abdominal muscles during the act. It is my belief that it is the latter which plays the most important *rôle* in keeping up the vomiting, or, in the case of myasthenic stomach, leading to fatal stercoræmia. This, in spite of the general belief that the jejunum is empty under the circumstances attending gastro-enterostomy. That it is not always empty I can testify from my own observations, and it must be remembered that it requires but a comparatively small quantity of the contents of the smal intestine to influence unfavorably the stomach.

Kocher, in order to ensure the passage of the duodenal contents past the gastric orifice in Wölfler's original method of gastro-enterostomy, and at the same time prevent the reflux of jejunal contents into the stomach, introduced his "valve method." This consists in forming a valve from the stomach wall, which opened outward and was designed to permit of the passage of the gastric contents while preventing reflux of both duodenal and jejunal contents. The operation is open to two very serious objections, however: First, it does not guard against overfilling of the duodenum and consequent inhibition of the contractions of the stomach; and second, however efficient it may be at first, it soon ceases to perform its functions as a valve, because of cicatricial contraction of its healed edges and consequent lessening of its area.

While Kocher aimed to form a valve from the wall of the stomach for the purpose of preventing reflux from either the

afferent or efferent limits of the intestinal loop, Sykow, of Moscow[1], attempted to provide a valve in the lumen of the intestine itself. In this operation the bowel and stomach are first sutured together with a sufficiently large area of stomach and bowel wall between the lines of suture to permit an opening of communication to be made later on through a transverse incision made in the intestinal wall. After effecting the communication with the stomach the incision in the intestine is sutured in an overlapping manner, thus forming a valve directed toward the lumen of the intestine. The objections to this, as in Kocher's valve operation, consists in the untrustworthiness of the valve, which must certainly contract as the healing process goes on. Theoretically it is inferior to Kocher's valve method, since it aimed only at preventing duodenal reflux.

At the Eleventh Congress of French Surgeons (Paris, 1897) Faure proposed a new procedure of gastro-enterostomy. It consists of an invagination of the stomach through a buttonhole-shaped opening in the bowel. The opening in the portion invaginated is turned toward the afferent limb of the intestinal loop, with the object of forming a valve at this point. The objections to this method are, first, it does not provide a sufficiently large opening between the stomach and intestine to provide against subsequent contraction ; and second, it presupposes an extent of mobility of the stomach necessary for the manipulation which is very rarely present. Even should the valve prove efficient, and cicatricial contraction not occur, the method is only applicable to benign stenosis of the pylorus and to cases of pylorectomy.

Sematzky,[2] on the basis of experiments in dogs, found the food passed through the anastomotic opening when entero-enterostomy was added to gastro-enterostomy, and lodged in the duodenum, from which it was regurgitated. The method which he advises in order to avoid this complication is that of oblique division of the jejunum and anticolic direct implantation of the

[1] Centralblatt für Chirurgie, 1898, No. 24, p. 631.

[2] Annals of Russian Surgery, 1899; Centralblatt für Chirurgie, 1899, p. 762.

obliquely cut the afferent portion into the wall of the stomach, and implantation of the afferent leg into the efferent jejunal loop.

Roux's presentation of a study of fifty cases of gastro-enterostomy[1] entitles that surgeon's opinion to respect. He prefers a method which he attributes to Courvoiser, but which is really a modification of Wölfler's second method. He calls it "gastro-enterostomie rétrocolique postérieure en Y." Following the usual steps of a posterior gastro-enterostomy, the jejunum is brought forward and divided at a point from 20 to 40 cm. below its point of crossing with the colon. The upper end is closed with a clamp and held toward the left by an assistant, and the lower end is implanted into the most dependent portion of the stomach by three layers of sutures. The upper end of the jejunum is now implanted from the direction of its natural situation, *i. e.*, from the left, into the lower one at a point 10 or more cm. below the junction of the latter with the stomach, likewise by three layers of sutures. The principal objection to this procedure is the time occupied in carrying it out. With those who, like Roux, insist upon a more rigid selection of cases, this will not be a very grave objection; its applicability to certain cases of gastroptosis, dilatation of the stomach, and non-malignant stenosis of the pylorus is insisted upon by its originator.

Doyen's gastro-enterostomy[2] was the first operation which—following the old lines of Wölfler's first method, which is undoubtedly a time-saving procedure, aimed to prevent the vicious circle from the passage of food into the duodenum, and gastric paresis from the same cause. This operator combined gastro-enterostomy with entero-enterostomy, and followed this by elimination of the afferent loop between the two points of anastomosis. After the usual procedure of anastomosis between the loop of intestine and the stomach, and that of the afferent and efferent portions of the loop, he divides the former. If this portion of the loop is long he resects it. The cut ends are now turned in so as to bring serosa to serosa, and sutured, thus leaving two blind pouches.

[1] Revue de gynécol. et de chirug. abdom., 1897, No. 1.

[2] Twenty-seventh Congress of German Surgeons, Berlin, 1898.

This operation is a great advance in the technique of gastro-enterostomy, but it is open to the objection that considerable time is consumed in effecting a trustworthy closure of the divided or resected ends of the afferent loop.

Luecke,[1] while acknowledging that Doyen's procedure is the most rational of all those which preceded it, called attention to the difficulty arising from the meeting of the bile and pancreatic secretion with the gastric contents at the orifice of communication between the afferent and efferent loops, the former passing in the direction of the stomach, while the latter pass in the opposite direction. In cases of muscular insufficiency, or myasthenic stomach, this circumstance may, according to Luecke, lead to some difficulty in the evacuation of the gastric contents. On the other hand, the latter may pass through the orifice of communication into the afferent loop. In order to overcome this, Luecke proposed to make the entero-enterostomy in such a manner as to secure peristalsis in the same direction, instead of in opposite directions, as in Doyen's operation. This is done by dividing the jejunum before effecting the gastro- and entero-anastomosis, instead of afterward, as in Doyen's operation, suturing the ends, as in the latter. He then makes a lateral anastomsis between the stomach and the efferent loop, finally, a lateral entero-anastomosis between the afferent and efferent loops, each with coincident peristaltic direction. By this method of operating the contents of the stomach and those of the afferent loop are moved in the same direction.

Up to the time of the publication of Luecke's article the operation had not been performed. While it appears to be rational, the time occupied in the procedure, will, I believe, prove a serious drawback to its general adoption. The fact that it is contraindicated where rapid completion of the operation is necessary will prevent its adoption in carcinoma cases, at least.

It is not at all certain that the objections raised by Luecke to Doyen's procedure are well founded. While it may be readily seen that if the anastomosis between the afferent and the efferent

[1] Wiener klin. Wochenschrift, 1899, xx.

loop is made close to the point where the latter joins the stomach, the passage of the duodenal contents propelled in an upward direction into this short portion of intestine might embarrass the propulsion of the gastric contents in the opposite direction; yet, if the entero-enterostomy is made at a point sufficiently low down to permit the gastric contents to become well clear of the stomach before encountering the upward current from the duodenum, the latter can have but slight influence upon the downwardly propelled gastric contents. As to the passage of the gastric contents through the orifice of communication and into the afferent limb, this is scarcely probable. Even if it should occur, it would be but in small quantities. It would be in the same condition, chemically speaking, as that which enters the duodenum normally, and would be expelled into the efferent loop again by the peristaltic action.

Witzel, of Bonn,[1] attempted to overcome the evils arising from the passage of the gastric contents into the afferent portion of the loop by combining posterior gastro-enterostomy with gastrostomy (gastro-enterostomosis externa). A soft-rubber catheter of large calibre open at the end is selected and buried in the stomach wall, after the author's method. Before closing the anterior portion of the opening between the stomach and intestine the lower end of the tube is slipped into the efferent limb of the jejunum for 10 cm., where it is secured in place by suturing it for 3 cm. to the mucosa of the intestine. The patient is fed at once through the tube with milk and brandy.

The method of gastroduodenostomy with the anastomosis upon the greater curvature, suggested by Henle and resorted to by Mikulicz,[2] was designed especially for a case of pyloric stenosis, with an ulcer upon the greater curvature, gastrectasis and vertical displacement. The anastomosis was made in close juxtaposition with the pylorus, and seems to have been entirely satisfactory throughout, although the report was made too early to determine whether or not contraction of the opening of communication would take place. The operation will cer-

[1] Centralblatt für klin. Chirurgie, vol. xlv. p. 1199.
[2] Ibid., 1898, No. xxiv., p. 752.

tainly not be required very frequently, and is only indicated where similar anatomical conditions exist.

A review of the literature of gastro-enterostomy in recent years, as well as my own experience with the operation, teaches me that the conditions most to be feared, next to collapse during or immediately following the operation, are the occurrence of first, the vicious circle; second, distention of the duodenum from forcible propulsion of the stomach contents directly into the afferent portion of the intestinal loop employed; third, reflux of the jejunal contents. While the first two may bear some relation to each other, the last named occurs independently of either of the others. If the theory which I have advanced that the jejunal reflux is first caused by mechanical pressure of the abdominal walls upon the efferent portion of the loop forcing the jejunal contents into the stomach is correct, every effort should be made to prevent the occurrence of vomiting. The first suggestion in this connection relates to the use of an anæsthetic for the operation. In order to prevent vomiting as an effect of the anæsthetic taking place, the operation should be done, whenever possible, under infiltration cocainization. This course would be of advantage, also, in lessening the tendency to fatal collapse, which so frequently follows the operation of gastro-enterostomy. It may be that further experience will show that the use of McGraw's elastic ligature will prove of use in respect to both the jejunal reflux and the occurrence of shock and collapse as well as the possibilities of infection, since the period of time occupied by the elastic ligature in completing the anastomosis, namely, from forty-eight to seventy-two hours, corresponds closely to that in which vomiting is most to be feared, and the rapidity with which the operation can be performed and the cleanliness which it makes possible guard against shock and infection. I confess, however, to a feeling respecting the elastic ligature akin to that expressed by Codivilla,[1] who, speaking of the use of the Murphy button in gastro-enterostomy, said: "Its good function is always in God's hands."

[1] A. Codivilla (Imola), Contributo alla chirurgia gastrica, Bull. delle Scienze med. di Bologna, 1898–99.

As to the possibility of distention of the duodenum resulting from the passage of food from the efferent portion of the intestine into the afferent portion, it may be said, in spite of Sematzky's experiments, that this danger is not to be greatly feared, certainly not to the extent of its occurrence in connection with its direct passage from the stomach into the afferent portion. With the orifice of communication sufficiently low down upon the efferent portion, and only large enough to permit of the free escape of the bile and pancreatic juice, and at the same time ensure against recontraction, neither this nor embarrassment of the gastric motor function should take place. These complications are the less to be feared, since, as shown by Kelling's experiments upon dogs, the passage of food from the stomach is intermittent in character.

This leaves us to deal with the symptoms arising from what is known as the vicious circle, whether these arise from the passage of food into the duodenum and its more or less prompt reflux into the stomach, followed by its ejection by vomiting, or from distention of the duodenum and a relative stagnation of the stomach contents from motor insufficiency. In either event the indications to be fulfilled consist in absolutely preventing any communication between the stomach and the afferent loop, and at the same time permitting of the escape of the biliary and pancreatic secretions from the duodenum, and their preservation for the purposes of digestion. Attempts at "peristalsis in coincidence" do not accomplish this with certainty, and, besides, are too dangerous, particularly the first method proposed by Luecke, for use, and valve formations are untrustworthy. Entero-enterostomy, by one or another of the methods devised, is a rational resource. Of these methods, that of making the anastomosis between a loop of the jejunum and the stomach, and subsequently establishing a communication between the afferent and the efferent portions of the loop, is the simplest and at first glance ideal. This procedure alone does not, however, prevent the passage of food from the stomach into the afferent loop, nor make ample provision for its escape after it has become lodged therein, particularly if the orifice at

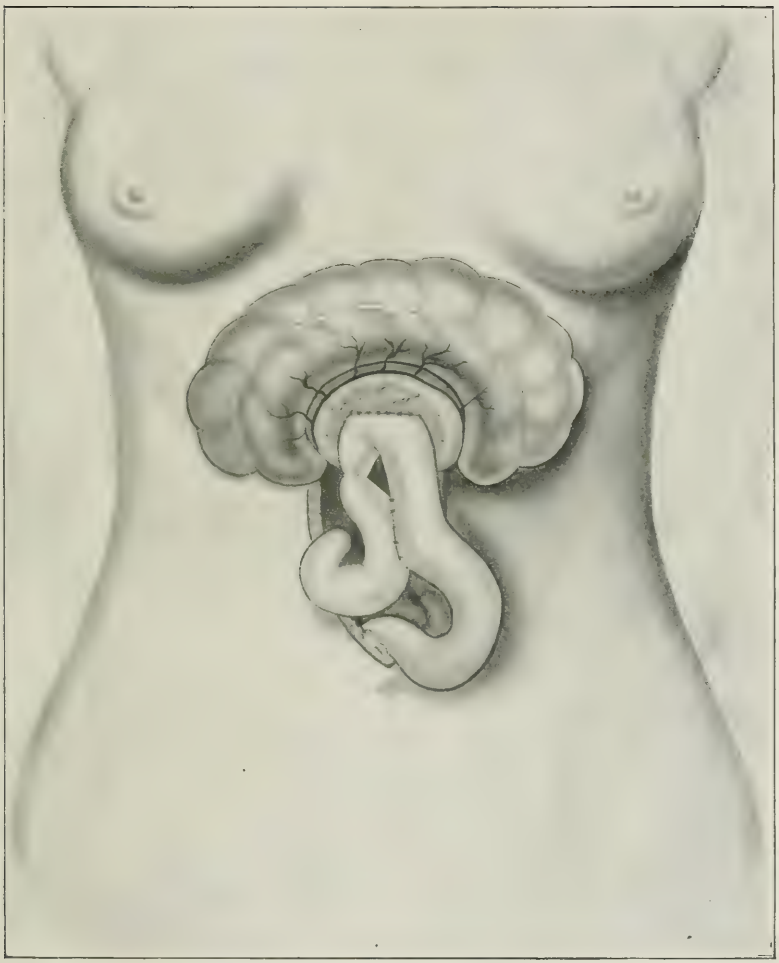
this point is only sufficiently large to permit of the escape of the secretion from the duodenum; to make the latter of larger size will serve to invite the dangers to which Sematzky has called attention. The indications arising from the vicious circle, as well as overfilling of the duodenum and consequent motor insufficiency, can only be met by absolutely cutting off all communication between the stomach and the afferent portion of the loop. All previous attempts to accomplish this—such, for instance, as Wölfer's second method of gastro-enterostomy by dividing the jejunum and implanting the efferent end into the stomach, and the afferent end into the efferent portion of the loop, or Roux's modification of this method ("gastro-enterostomie rétrocolique postérieure en Y"), Doyen's method of dividing the afferent portion of the loop after the anastomoses are established and suturing the ends so as to form blind pouches of these, and Luecke's modification of Doyen's method by dividing the jejunum first, and then closing the ends and making flatwise approximation at the points of anastomosis, and providing at the same time for coinciding directions of peristalsis—all of these require an amount of time too great to render them at all safe in the class of cases in which the operation is most urgently demanded, namely, patients almost at the point of starvation. In these cases, at least, some method must be devised which shall secure to the patient the maximum of benefit with the minimum of risk.

With this object in view I have devised and employed in these cases a method of gastro-enterostomy which consists, in brief, of first securing a communication between a loop of the jejunum and the stomach, then an entero-enterostomy between the afferent and efferent portions of this loop, and, finally, obliteration of the lumen of the afferent loop between the two points of anastomosis. I have selected the simplest and most rapid method of performing gastro-enterostomy and added to it a procedure which occupies but a minute or two, and yet absolutely precludes the possibility of direct intercommunication between the stomach and the afferent loop. This step in the operation is accomplished by passing a No. 20 silver wire two or three times around the afferent loop at the point selected

and drawing upon the turns sufficiently to occlude the lumen without strangulating the wall of the intestine. The ends are twisted together, cut short, and the ends rolled into a flat coil in such a manner as to bring the cut ends in the coil, thus guarding against subsequent injury to the surrounding structures. The accompanying illustration (Fig. 5) shows the appearance of the parts at the completion of this portion of the operation.

The application of a ligature to the small intestine for the purpose of occluding the lumen of the gut is not new. My first knowledge of it was derived from Dr. Dawbarn's work on the cadaver in the operative surgery classes at the New York Polyclinic. For a number of years I have employed it as a part of the procedure of ileo-sigmoid anastomosis in cases of fecal fistula in the cæcal region, for the purpose of occluding the portion of ileum between the point of anastomosis and the fistula. Realizing that in these cases it would be desirable to provide for the eventual restoration of the large intestine to the uses of the fecal current, I at first employed kangaroo tendon for the ligature, but found that this material was not sufficiently stable for the purposes of spontaneous closure of the fistula. I then used a heavy silk ligature, and found this answered the purpose more satisfactorily, although in one case of unusually large fecal fistula following gangrene of the cæcum occurring in connection with appendicitis, the silk ligature gave way at the end of three months. In this case there was afforded the opportunity of observing whatever untoward effects might have resulted from the application of the ligature. None such was found. There was nothing to show that the intestine had been constricted, although the fistula had been free from discharge for nearly three months, the discharge returning with all its former profuseness ten days prior to the second operation. The silk ligature had given way, restoration of the fecal current had followed, and all macroscopic evidences of the constriction which the ligature had caused had disappeared. A silver wire ligature was applied at the second operation, with entire success.

FIG. 5.



The author's method of gastro-enterostomy.

These remarks upon ileo-sigmoid anastomosis and occlusion of the afferent portion of the ileum are introduced for the purpose of showing the foundation of the new method of gastro-enterostomy designed to prevent the interchange of contents between the stomach and duodenum.

The procedure herewith suggested for fulfilling the last-named indication consists essentially of the following steps:

1. Gastrojejunostomy with entero-enterostomy between the two limbs of the jejunum.

2. Circumclusion of the afferent limb of the jejunum between the points of anastomosis, by means of a silver wire ligature.

Case I.—L. K. H., female, aged forty-nine years. Patient admitted to the Methodist Episcopal Hospital with a history of suffering from flatulent dyspepsia for one year, with eructations of fluids and dull, aching pains in epigastrium. An acute attack of nausea and vomiting occurred three months prior to admission, since which time she has taken only liquid food and raw milk and eggs. Upon admission the patient presented an emaciated appearance. No tumor could be felt. She complained of dull, aching pains, which sometimes became sharp and lancinating, in the epigastric region.

June 29, 1901, the operation of posterior gastro-enterostomy and entero-enterostomy, with circumclusion of the afferent loop between the points of anastomosis, was performed. The stomach was found to be the seat of diffuse carcinoma, most marked at the pylorus.

The patient was allowed milk in small quantities, beginning on the first day following the operation; but as this caused vomiting it was discontinued on the third day, and the patient fed by nutrient enemata, when the vomiting ceased. The enemata were not well borne, and on the fourth day the feeding by mouth was cautiously resumed. From this time the patient steadily improved, and was discharged from the hospital on the twenty-first day.

Case II.—G. H., aged forty-seven years, was admitted to the Methodist Episcopal Hospital with a history of having been a hard drinker. One year ago he began to vomit immediately after meals. The attacks of vomiting have more recently increased in frequency and severity. Dull epigastric pain, first noticed six months ago, at which time he detected a movable mass through the abdominal wall, which on lying down he could see in motion. He has lost forty

pounds in weight, and his appetite has greatly decreased during the past six months.

November 27, 1901. Operation of posterior gastro-enterostomy and entero-enterostomy, with circumclusion of the afferent loop between the points of anastomosis. The pylorus was found involved in a carcinomatous mass the size of a lemon, with secondary deposits in the omentum.

The patient was given a saline solution enema with whiskey on the first day, and thereafter was fed by nutrient enemata. The day following the operation he had one attack of postoperative vomiting, but none thereafter. On the third day feeding by the stomach was cautiously instituted, the amount being gradually increased until the twelfth day, when he was allowed general diet, which he enjoyed greatly. He was kept in the hospital for observation for five weeks, when he was discharged. He reports at the out-patient department occasionally (seven months after the operation). He is now jaundiced, and shows evidence of hepatic involvement.

Case III.—This is the case of duodenal obstruction related in the earlier portion of this paper. Posterior gastro-enterostomy and entero-enterostomy, with occlusion between the points of anastomosis. The patient died of cardiac failure twelve hours after the operation. No autopsy was permitted.

Case IV.—L. B., aged sixty-one years, was admitted to the German Hospital on May 19, 1902, with a history of having suffered from "dyspepsia" for a year past. He had more recently developed vomiting, and within a few days past it was discovered that food taken the day before was vomited the next morning. He has lost greatly in flesh and strength for the past six months. Examination discloses a fist-sized tumor occupying the site of the pylorus.

May 20th, a posterior gastro-enterostomy and entero-enterostomy between the two loops of the jejunum was performed, to which was added circumclusion of the afferent loop. An attempt was made to perform the operation under cocaine infiltration, but the patient would not permit it. Chloroform was then resorted to, but on account of the weak heart-action ether was finally substituted. The carcinomatous mass was found to extend well up on the lesser curvature and the anterior wall of the stomach as well. Some difficulty was encountered in procuring a sufficiently large area of the posterior wall through the opening in the mesocolon to serve the purposes of the gastro-enterostomy, and on account of the limited space finally obtained I

was led to resort to the elastic ligature of McGraw. The entero-enterostomy was done in the usual manner, *i. e.*, first the application of a running Lembert suture uniting the two loops, then incision of both loops and sewing the edges with catgut, and finally continuing the running Lembert suture so as to completely enclose the anastomosis formed by sewing the intestinal edges directly together.

The patient rallied well from the shock, at no time suffering from nausea or vomiting. Feeding by the rectum was commenced at once, and drachm doses of milk and brandy were given by mouth twelve hours after the operation. These were well borne. He was cheerful and happy, free from all discomfort, and promised a speedy recovery from the operation, when, on the second day, he was seized with a left-sided pneumonia, which rapidly extended. In twelve hours the right lung became involved. He died fifty-four hours after the operation.

The autopsy showed that the elastic ligature, although it had indubitably included and was deeply embedded in the stomach and intestinal walls, had not effected an anastomosis.

Case V.—J. D., aged forty-four years, was admitted to the Brooklyn Hospital on May 21, 1902, with a history of obscure gastric symptoms extending over a period of two years. One year ago he was operated upon for appendicitis. His more recent symptoms have been regurgitation of fluids, distress in the epigastrium after eating, and flatulency. The breath is foul, tongue coated, and an offensive taste. Examination shows gastrectasis and gastroptosis.

On May 22d the abdomen was opened and the diagnosis confirmed. No palpable alterations at the pyloric orifice could be made out. Posterior gastro-enterostomy and entero-anastomosis between the loops was performed, and to this was added circumclusion between the points of anastomosis.

The patient was given saline and nutrient enemata on the day of operation, and rectal feeding was kept up for three days. On the second day peptonized milk was given by mouth and cautiously increased. There was slight shock, no vomiting, and recovery was rapid and uninterrupted. He was kept in the hospital for observation and discharged at the end of the fourth week. He had no eructation, but complained of occasional epigastric distress. At the present time he is in excellent health.

Case VI.—J. N., aged thirty-one years, admitted to the Methodist Episcopal Hospital May 22, 1902. The patient gave the following

history: Fourteen years previously sustained a fall upon left hypogastrium. Three months later he vomited a small amount of bright-red blood. From that time until the present the attacks of vomiting, followed by distention of abdomen and jaundice, have occurred at intervals of from five weeks to eight months. He has been constipated, with clay-colored stools, for five years. Has lost much flesh and strength. Blood examination shows red cells, 3,568,000; white cells, 22,000; hæmoglobin, 55 per cent.

May 24, 1902, the operation of posterior gastro-enterostomy and entero-enterostomy, with circumclusion of the afferent loop between the points of anastomosis, was performed. Three hours after operation the patient vomited six ounces of dark-green fluid and complained of considerable abdominal pain. Shock was pronounced. The patient rallied well, however. Rectal feeding being well borne was kept up until the fifteenth day; feeding by the mouth was delayed until the fifth day. At the commencement of the third week symptoms of diffuse septic peritonitis occurred, and he died on the twenty-third day following the operation.

The autopsy revealed a diffuse purulent peritonitis with a localized pus collection about the entero-enterostomy, which was found to communicate with the jejunum at a point where the insufficiently united serous surfaces had given way.

The silver wire occlusion ligature and the intestine near it were in good condition. On opening the stomach an ulcer was found. The signs of an old splenitis and perisplenitis were also present.

CURVILINEAR PRERECTAL OPERATION FOR PROSTATIC ABSCESS.

By JOSEPH RANSOHOFF, M.D., F.R.C.S.,
CINCINNATI.

THE many-sided studies which the operative surgery of prostatic hypertrophy has received during the last two decades have of necessity thrown an indirect light on the allied subject of prostatic abscess. Of recent years the latter has not received much direct consideration, perhaps because of the relative infrequency of such abscesses, or because their treatment was considered a closed chapter. If we exclude the acute follicular suppurations of the prostate which attend gonorrhœa, suppuration within the parenchyma is relatively rare. It is certainly so with regard to those cases that become the object of operative interference. An examination of the reports of large general hospitals will show that the experience of every surgeon must be limited to the matter of parenchymatous prostatic abscesses; that, too, whether they be of gonorrhœal, metastatic, or tuberculous origin, or appear as complications of hypertrophy. The report of the Massachusetts General Hospital for eight years shows only thirteen cases of acute prostatitis, in a total of 25,000 surgical patients. Several of these acute cases were not designated as prostatic abscess.

That these abscesses are sometimes overlooked cannot be questioned. Fortunately the symptoms, both local and general, indicate both the nature and seat of the trouble in most cases. In others, however, the abscess assumes a latent form, where, without functional disturbance of either urethra or bladder, periprostatic phlegmons of gravest omen are developed. Recently there was admitted to my ward in the Cincinnati Hospital a man,

aged sixty years, who was morbibund from septic infection. The autopsy revealed an enormous phlegmon of both ischiorectal fossæ, a gangrene of the anterior rectal wall, and a sloughing prostate gland. Running free through the large cavity were two inches of the intact urethra. The vital resisting power of the urethral wall under stress of sloughing processes around and about it, as seen in extravasation of urine, is often observed. It is a factor to be considered in all perineal operations on the prostate, to which reference will be made later on.

Regarding the diagnosis of prostatic abscess, when the condition is once suspected there is but little difficulty. The rectal touch, which is never neglected by the surgeon in pathological conditions of the male pelvis viscera, is unfortunately not so often made by the busy practitioner. Therefore, its diagnosis is at times not made until invasion of the rectovesical fascia has taken place. But this very invasion decreases the value of the rectal touch for accurately determining the condition of the prostate gland. When once the finger feels a soft, indentable, fluctuating spot underneath the rectal mucosa, it can no longer be determined to what extent the suppuration is intraprostatic or periprostatic. The importance of this observation seems emphasized by the compilation of Ségond;[1] in forty-three out of sixty-seven cases the abscess pointed in the rectum. Furthermore, the value of the rectal touch is diminished in the abscess complicating prostatic hypertrophy. Fortunately, this is counterbalanced by the prominence of other signs, notably the intermittent urethral discharge, which makes the recognition of this secondary infection relatively simple.

A very large proportion of prostatic abscesses, if untreated, open into both rectum and urethra (twenty-one out of sixty-seven). Such cases are either rapidly fatal, or, if recovery ensues, leave urethrorectal fistulæ that are often beyond relief. A dominant factor in determining the method of attacking a prostatic abscess must always be the relation this bears to the urethra. In fifty-five out of 115 cases the abscess opened spontaneously into the urethra or was opened by the beak of a passing instrument. It is self-evident that in this category

would be found a large number of follicular abscesses, or such, at any rate, as would not be deeply placed within the parenchyma. How frequently the urethral drainage of even these superficial abscesses is insufficient is manifested by the chronicity of the discharge and the recurrence of retention symptoms.

Whatever the primary source of their infection, deep-seated prostatic abscesses develop within the gland substance without entangling alliances with either urethra or rectum, although with the growth of the abscess there is a tendency to open into either channel in the order given. How this affects the operative treatment of prostatic abscesses seems plain. To go in between the urethra and rectum is the direct inference. Nevertheless, the urethral or rectal routes are still recommended. In what I believe is the last edition of Harrison's classical work,[2] he recommends that the abscess be opened with a urethral sound guided by a finger in the rectum, and has a full-page illustration of the method. Only when the whole prostate is involved does he advise a median perineal incision. The use of the Bottini incisor recently advised for the same purpose is a technical improvement of the intra-urethral operation, but based on the same principles, which I believe to be wrong. On the other hand, the transrectal incision of prostatic abscesses still has many advocates in higher quarters. Of two cases from the Heidelberg clinic of 1902[3] one was operated on through the rectum. Guiard[4] and Routier,[5] who perhaps reflect the views of many French surgeons, regard the rectal incision as the normal one for opening prostatic abscesses. This seems the more strange in view of the favor which perineal prostatectomy has found with the foremost genito-urinary surgeons of France.

The very gratifying results recently obtained in three cases of prostatic abscess with the curvilinear prerectal incision without opening the urethra seem to warrant the presentation to you of a brief report.

Case I.—G. W., aged twenty-four years, was admitted to the Jewish Hospital January 30, 1902. Family history negative. Had an attack of typhoid fever six years ago; gonorrhœa eight months ago. During

three or four years has had symptoms of gallstone colic. The attacks, coming every three or four months, were occasionally followed by jaundice. Has been confined to a London hospital for a like attack. Present illness has lasted one week.

Present Condition. Well-nourished young man; chief complaint, pain in the region of the gall-bladder, over which there is a marked tenderness. Temperature on admission, 102½°; pulse, 110. Physical examination shows great tenderness over the gall-bladder, without either enlargement of gall-bladder or liver. Tongue coated, bowels rather constipated. From day of admission the temperature gradually subsided until from the fifth day after admission to the tenth day it remained normal. On this day there was again an elevation to 102°, which subsided by the thirteenth day, when it was again normal. Diagnosis: cholecystitis, probably of calculous origin.

Operation, February 11, 1902. Cholecystotomy. Gall bladder found considerably thickened and slightly enlarged, but very adherent to omentum, colic arch, and pylorus. These adhesions were readily severed. The incision into the gall-bladder gave vent to a turbid, ropy bile, containing biliary sand in considerable quantity. Gallstones were not found. The biliary ways were patent. Drainage of gall-bladder. From the day of the operation the patient's temperature returned to the normal and remained so until February 18, when there again was a rise to 102°; from this time to the 23d it again remained about normal, when it rose to 103°. It then fell rapidly and continued about normal until March 4th. Five days after the cholecystotomy there appeared a profuse, purulent urethral discharge, the examination of which showed an abundance of Neisser diplococcus. Within four days of its presence the patient complained of intense pain in the perineum and rectum and of frequency of micturition. Examination at this time showed a considerably enlarged and exquisitely tender prostate. Hot baths, opium, and belladonna were ordered as required. Notwithstanding the continuance of a normal temperature and normal pulse-rate, the local symptoms increased in severity. Rectal touch revealed fluctuation indistinctly. Diagnosis: prostatic abscess.

Second Operation, March 4, 1902. Prerectal curvilinear incision beginning near the tuber ischii of the right side curving around and within an inch of the anal orifice to the same point on the left side. A staff was not used. After the division of the superficial fascia with a few fibres from the external sphincter to the bulbo cavernosus, the bulb of the corpus spongiosum and the transverse perineal muscles

were readily exposed and drawn forward with a blunt retractor. The rectum was then drawn backward, and in the depth of the wound the fibres of the levator ani and the compressor urethræ were held aside after blunt dissection. By this blunt and almost bloodless dissection the rectum was easily separated from the posterior surface of the prostate gland. The urethra was not opened. With an aspirating needle the abscess within the gland was easily located. It was opened through a median posterior incision. Vent was thus given to about one ounce of thick, creamy pus. The examination of this later showed the Neisser diplococcus and the staphylococcus. A small drainage-tube was inserted into the abscess cavity, and the large wound, which had somewhat the appearance of the vagina, was readily closed by three silkworm-gut sutures on each side of the middle line. The hemorrhage during the operation was almost *nil.*

Subsequent History. From the day of operation there was not again any elevation of temperature. The discharge decreased rapidly. The patient left the hospital April 1st, entirely well.

Case II.—F. A., aged thirty years, admitted to Good Samaritan Hospital March 3, 1902. Referred by Dr. Garlick. First attack of gonorrhœa eight weeks ago. Discharge lasted four weeks and ceased two weeks before he came under physician's observation. With cessation of discharge the patient noticed a sense of weight in the perineum and pain on defecation. Referred most of his symptoms to the rectum. Symptoms on the part of the bladder and the urethra had been negative since cessation of discharge. Has had neither chill nor elevation of temperature.

Status Præsens. Well-nourished male, short stature, weighing 180 pounds. Complains only of pain in rectum and of tenesmus. Frequency of micturition; temperature and pulse normal. Blood count shows 6800 leucocytes. Urinalysis: Urine slightly turbid, due to presence of pus cells; otherwise normal. Rectal touch reveals an exquisitely sensitive prostate, considerably enlarged and tense to elasticity. Rectal wall easily movable over posterior surface. Diagnosis: small prostatic abscess.

Operation, Good Samaritan Hospital, March 14. Morphine-chloroform narcosis. The operation was made as in the previous case. The exploratory needle revealed a deep-seated abscess, which was evacuated by a small median incision through the posterior wall. The opening was enlarged by the Hilton method. About a tablespoonful of pus was evacuated. Culture revealed only the staphylococcus.

Drainage as in the prevous case was provided for, and the wound was closed.

Subsequent History. Except for the occasional and slight escape of gas from the drainage tube from the fourth to the eighth day, the recovery was uneventful. The dissection having been made close to the rectal walls it is probable that a limited necrosis ensued. An examination of the rectum seemed uncalled for and was not made. The patient left the hospital eighteen days after the operation, entirely recovered. He presented himself for examination April 29th, stating that he had resumed his work for the past three weeks and felt entirely well. There was no recurrence of the urethral discharge.

Case III.—F. B., aged twenty-three years, single, hostler. Entered City Hospital May 17, 1902. Had gonorrhœa five or six times, Stated that six weeks ago there developed a new case. It ran its usual course until two weeks ago, when he noticed great pain about the scrotum, which was increased during defecation.

The temperature ranged from 100½° to 101°; at his admission, 101°. The following day a leucocytosis of 2000 was passed. Physical examination: A well-developed male, weighing nearly 200 pounds. Normal except for urinating symptoms. Patient is unable to urinate without use of the catheter. Examination of the prostate through the rectum shows it to be very tender and slightly enlarged. Operation May 19. Prerectal curvilinear incision as in the cases above reported. Abscess located with aspirating needle and opened by median incision. Hemorrhage very slight. Drainage-tube and iodoform gauze packing.

Subsequent History. From time of operation patient's temperature went to the normal. Control of the bladder with normal expulsion of the urine was regained the day following the operation. May 30th the wound has almost healed; the patient is about ready to leave the hospital.

One valid but slight objection has been urged to the prerectal incision. It was encountered in the second case. I refer to the sloughing of the anterior wall followed by a fistula. I imagine that when large prostates are removed this danger would be somewhat greater. By adhering closely to the prostatic capsule and guiding the cleavage away from the rectum, this danger will be minimized. The advantages of this method

of operation fully outweigh this possible though not probable wound complication. The difficulty of bringing the prostate into the perineal wound has been extensively considered and various methods devised for this end. Among these might be cited preliminary suprapubic cystotomy or opening of the prevesical space, through which the prostate can be pushed toward the perineal wound. Syms[6] has recently devised a rubber bag to be introduced into the bladder through a boutoniere, then to be filled with water and used for drawing the prostate into the wound. I have found none of these devices necessary in reaching the prostate, and believe that the same can be accomplished by the use of a short-beaked stone searcher, which by being firmly depressed can be made to bring the prostate within easy access for any manipulation that might be needed. In prostatic hypertrophy, when a major operation is indicated and the opening of the urethra is not essential, the method of reaching the gland as above indicated will, I think, give the best results.

The first case presented is of interest from the view-point of diagnosis. In the absence of the finding of the prostatic abscess by the second operation, the conditions found at first would have been deemed sufficient to explain the symptoms. Two years before this operation the diagnosis of cholecystitis had been made in a London hospital. Although no acute inflammatory conditions were found in the gall-bladder or biliary ways, it still seems probable that the prostatic abscess developed during the convalescence from the first operation. The salient features of the second case were the predominance of the rectal symptoms and the absence of all signs pointing to a serious involvement of the prostate. In both cases there was conspicuous by its absence the complex of symptoms usually associated with prostatic as with other deep-seated abscesses, namely, rigor, pyrexia, and rapid pulse-rate. The interpretation of this might be found in the fact that the suppuration was inclosed within the tight capsule of the gland, which made absorption difficult. It is with the invasion of the loose periprostatic connective tissue by the suppuration that the systemic

symptoms develop, much as they do in the periadenitis following the mixed infections of the cervical glands.

If we exclude as thoroughly uncommendable the rectal methods of incising prostatic abscesses there remain only for our consideration the various perineal incisions, of which I may be permitted to make a brief comparison. The median incision must always hold a prominent place for the quick exploration of the deep urethra, prostate, and bladder; but the field of its usefulness will grow more and more restricted with the betterment of diagnostic methods and the substitution of the crushing for the cutting operation for stone. Its chief merit is in its relative bloodlessness. This advantage is, however, largely lost in prostatic subjects because of the difficulty of avoiding the bulb, which is so often enlarged, and because of the difficulty of hæmostasis when hemorrhage does occur. The limited field of operation makes the sense of touch rather than that of sight the guide of the operative manipulation. This is one of its faults. The opening of the membranous urethra, a *sine qua non* of the median operation, is another and very serious one. However desirable this may be when bladder drainage is demanded, it subjects the patient often to the inconvenience of temporarily losing control of the bladder, and unfortunately often leaves an embarrassing urethral fistula. I have seen this in a number of cases of gonorrhœal and of tuberculous abscess operated upon in this way. On the other hand, the prerectal incision, as before described, does away with this danger altogether. It allows a free inspection of the field of operation such as can be obtained by no other method. Hæmostasis, not very difficult, can be done in plain sight, and unless special indications exist for opening the urethra, this can be absolutely avoided as in the cases above reported. In subjects with enlarged or inflamed prostates the submucous plexus of veins is turgid. Those familiar with suprapubic prostatectomy know the severe bleeding which immediately follows the incision of the mucosa. In the operation of prostatectomy by median incision the hemorrhage is as free, but its source is not patent. By avoiding the opening of the urethra, wherever possible, this

grave element of danger is largely eliminated. In the judgment of the writer, it was a retrograde step when operators receded from the original idea of Dittel not to open the urethra in perineal protatectomy. The ease with which everything in front of the incision—bulb, transverse perineal muscles, and even membranous urethra—can be drawn forward reduces to a minimum the danger of hemorrhage. The division of the superficial perineal vessels occurs in an open wound, where they can easily be seen and tied.

Various modifications of the prerectal operation have been made, all making far greater room for operative work. In the operation for prostatic abscess the prerectal incision alone will suffice. For the major operation of prostatectomy, an incision made from the right extremity of the initial cut into the ischio-rectal fossa and carried around the right side of the anus toward the coccyx affords an abundance of room for the thorough isolation of the prostate before its removal is commended. This operation, devised by Gosset and Proust,[7] permits the operator to displace the rectum backward and to the left. I have not had an opportunity of doing the operation on the living, but in the cadaver it has seemed to me ideal.

Bibliography.

1. Ségond. Traité de chir., T. vii.
2. Harrison. Dis. Gen.-urin. Org., p. 277.
3. Beit. z. kl. chir., xxxi., p. 182.
4. Guiard. Annal. de Malad. Gen.-urin., 1899, No. 13.
5. Routier. Presse Méd., 1900, No. 13.
6. Syms. Ann. of Surg., March, 1902.
7. Gosset and Proust. Ann. de Mal. Gen.-urin., 1900, p. 42.

THE IMPLANTATION OF SILVER FILIGREE FOR THE CLOSURE OF LARGE HERNIAL APERTURES.

By WILLY MEYER, M.D.,
NEW YORK CITY.

Large hernial apertures are frequently met with in surgery. They are always a source of more or less perplexity and concern to the surgeon called upon to relieve the condition.

They occur as a result of long-existing ruptures with atrophy of the adjacent muscular and fibrous tissues, but more frequently in consequence of previous surgical intervention (recurrent hernia, prolonged drainage, faulty asepsis, etc.).

In his efforts to close these large defects it is the surgeon's aim to make use of the tissues as found in the patient himself whenever possible. Thus, for instance, in the case of a large umbilical or ventral hernia of the linea alba we split the sheath of the recti muscles, loosen their belly, move them toward the median line, and stitch them together by means of chromicized catgut, kangaroo tendon or silver wire (Gersuny, *Centralbl. f. Chir.*, 1893, No. 43); or, when dealing with an umbilical hernia, we can also make a plastic operation according to Piccoli (*Centralbl. f. Chir.*, 1900, No. 2): In case of a wide gap in the abdominal wall in the appendix region, where the normal borders cannot be reunited, we utilize the outer half of the rectus muscle for transplantation into the defect.

As regards the treatment of large defects in inguinal and femoral herniæ, Trendelenburg was the first who successfully sutured a disk taken from the head of a recently resected humerus into the aperture (*Reports of German Surgical Congress*,

1890, No. 133). Later he modified his procedure by turning into the hole a pediculated periosteal bone flap that had been chiselled out of the patient's pelvis. The same procedure was recommended by Kraske and Koerte (*Handb. der Praktischen Chir.*, vol. iii. p. 645).

Although in possession of these various useful methods, we nevertheless occasionally encounter herniæ of such enormous dimensions that we know beforehand we cannot permanently cure them by any of the aforementioned procedures. Such cases have been hitherto considered incurable, and many surgeons, apprehending the negative result, have refused operation. Yet it is just this class of patients who most urgently request and need surgical help.

It is, therefore, gratifying to know that the implantation of silver filigree bids fair to fill this gap in our therapeutic resources.

Schede was the first to champion the use of silver wire in closing abdominal incision, swith a view to preventing a subsequent hernia. His sutures embrace the entire thickness of the abdominal parietes, exclusive of the skin. He has practised this method for many years, and has never since seen a ventral hernia occur after any of his abdominal operations where the wound could be thus closed (*Centralbl. f. Chir.*, 1900, p. 257, footnote).

The discovery of the strong antiseptic properties of silver, by Credé, gave a fresh impetus to the more extensive use of this material in operative surgery.

In 1900, O. Witzel, of Bonn, published his method for the closure of abdominal wounds and hernial apertures by means of buried silver wire netting (*Centralbl. f. Chir.*, 1900, pp. 257, 457, and 1149). He uses wire of different thickness, and aims to prevent the appearance of a ventral hernia by arranging his sutures in various directions and layers across the opening, leaving the network of wire thus produced permanently in place. The ends of the sutures are always twisted with the fingers, the cut ends being left about 1 cm. long and held down by the subsequent superficial wire sutures in such a way as not

to give rise to future annoyance by pricking from within. For the cure of recurrent hernia, after the failure of one of the radical methods now in general use (Bassini, Kocher) buried wire netting of larger dimensions is made use of. In these cases the peritoneal cavity is not opened if it can be avoided. First, the borders of the hernial opening, after proper exposure, are brought into closer proximity by means of interrupted wire sutures of medium size, which are made to cross one another, or by a continuous suture, as the case may require, without producing undue traction. A needle with a long piece of much finer silver wire is then plied transversely and obliquely across these sutures until a regular fine network has been formed. The peritoneum is included in these sutures whenever necessary, in order to avoid dead spaces. Witzel thinks that the wire network should be at least three times the size of the hernial aperture. He states "the farther the sutures are carried beyond the border lines of the opening, the better will be the result," since pressure and constriction of the enclosed tissues will thus be less likely to be produced. As above stated, he forms the netting himself within the wound during the operation, and gives special directions as to how to proceed in the different varieties of hernia.

The publication by Witzel of this method of closing abdominal defects with silver wire netting induced R. Goepel, of Leipzig (*Centralbl. f. Chir.*, 1900, No. 17, p. 458), who had been working along similar lines for some time, to also make public the result of his own experience with the implantation of *ready-made* silver wire netting as a means of closing hernial apertures, so that these two communications came to be published almost simultaneously.

Goepel's report covers a period of more than three years, the first operation having been done in March, 1897.

He points out the following advantages of the ready-made silver filigree over the self-made wire netting:

1. The tissues bordering the hernial aperture are less exposed to injury and constriction.

2. The time required for the operation is reduced.

3. The meshes of the ready-made wire pad are of equal and regular dimensions, a diastasis, even of small size, is less often met with.

4. The amount of silver wire left within the wound is reduced to a minimum.

In cases of umbilical and ventral hernia, the shape of the net is round, oval or quadrangular, with blunt corners; it is sutured upon the aponeurosis of the abdominal muscles bordering the aperture.

In inguinal hernia the net has the figure of an acute angular triangle with the base turned toward the median line, where a small excision has been made for the spermatic cord. It rests on the internal oblique or transversalis muscle. The sides of the triangular wire pad are attached to Poupart's ligament below and the muscles above.

Goepel's report comprises eleven cases of umbilical and ventral hernia and seven cases of inguinal hernia in which the implantation of silver filigree, just referred to, was practised, with but two failures. In the latter the formation of a hæmatoma necessitated the removal of the netting. In some of the successful cases the hernia was the size of a child's head. The largest net implanted was 10½ by 17 cm. = 4 by 6¾ inches in size. By taking proper care in securely fastening the borders of the wire pad, even patients of the working-class were not molested by the presence of the foreign body.

In the United States, A. M. Phelps, of New York, has worked in the same direction since 1892. On the basis of his experience with silver wire he recently advocated the discarding of all absorbable suture material (chromicized catgut and kangaroo tendon), now so universally and successfully employed in our radical operations for hernia, in favor of silver wire (*New York Medical Record*, September 22, 1900). To forestall the possible relapse of a hernia he promptly fortifies "the inguinal canal with a mattress of wire, stitching the muscular layers over it, entirely obliterating the inguinal canal, bringing the cord out underneath the skin, and cutting the aponeurosis of the muscles, so as to prevent strangulation of the cord." The sutures are

continuous, sometimes arranged in layers. Abdominal wounds he closes with silver wire and fortifies them.

Since 1892, 216 cases of hernia have been thus treated; among these were forty-six relapses after Bassini's and fifty-one after other operations.

However, as the title indicates, the purpose of this paper is not to discuss the usual radical operation for hernia, but to deal with large defects in the abdominal wall that cannot be closed by any means other than heteroplasty.

After having personally employed Gersuny's method for a number of years to my entire satisfaction (*Annals of Surgery*, 1900, vol. xxxi. pp. 746 and 747), and having also given the transplantation of the outer half of the rectus muscle a trial in a case of large rupture in the appendix region following drainage, a patient came under my care last summer in whom any kind of autoplasty was absolutely out of the question. The history of the case is as follows:

Case I.—Male, aged fifty-five years; butcher, was operated upon for strangulated hernia, March 17, 1898, by another surgeon. Wound was left open. He was discharged from the hospital after eleven weeks, with the wound healed and a beginning hernia. All forms of trusses being uncomfortable, the defect in the abdominal wall was left unprotected for several years, in spite of heavy bodily work. June, 1901, the pain became unbearable. Admitted to German Hospital with large ventral hernia; insisted upon operation; ready to take any chances.

Operation, June 13, 1901. Circumcision of scar; peritoneum opened; careful dissection of manifold adherent intestinal coils. Poupart's ligament cannot be distinguished; seems missing. Enormous gap extending from border of atrophied and unyielding abdominal muscles to horizontal part of pubic bone. I decided to try and close the opening with a silver wire netting. Eight to ten interrupted sutures of heavier wire are used for the deep layers; moderate tension is brought to bear upon these in order to bring the superior border line of the defect as closely as possible to the pectineal fascia and periosteum of the pubic bone. These sutures are then interwoven in all directions by long, continuous sutures of silver wire of finer grade.

The needle is passed up to a line fully one and one-half inches above the aperture. The beginning of a new thread is twisted to the end of the former one. The work is difficult on account of the immediate proximity of femoral and external iliac vessels, which appeared exposed for a distance of several inches. The vein, pulled outward by a blunt retractor, immediately adjoins the inner border of the netting. Suture of remaining shreds of fascia and of the skin, by means of catgut without drainage, completes the operation. Very little reaction. Primary union throughout. After a while a small sinus, discharging serum, forms at inner angle of scar. The same closes within about six weeks. For safety's sake the patient is kept on his back for eight weeks. He is discharged on the 19th of August without a truss; result perfect. Ten days later he is, in spite of my advice to the contrary, back at his former heavy work; after two or three weeks the sinus reopens, discharging slightly. It is left undressed, and patient continues his work. First examination of patient after operation, November 18. Silver pad protects aperture nicely. At its upper outer angle, near the anterior superior spine, a hernia of small dimensions is noticed which is said to have appeared about four weeks ago when carrying a heavy piece of meat. It corresponds to the direction of the femoral vessels. Additional operation and attention to fistula advised. Seen again May 26, 1902. Condition about the same, fistula closes and reopens; no medical attendance. Patient states that he has been greatly benefited by the operation, and is perfectly able to attend to his heavy daily work.

[NOTE.—On June 7, when lifting a cake of ice from the wagon and carrying it into the store, the patient felt a sudden intense pain within the abdomen. He soon had to quit work; vomiting set in; passage of gas ceased. Two days later he was brought to the hospital in poor condition; operation was promptly performed. It was found that an incomplete intestinal obstruction, due to manifold old standing adhesions between coils of the small intestine, had suddenly become complete; beginning peritonitis in the neighboring coils. The wire netting had no relation to the trouble. The patient died soon after the operation. Only a very limited and hurried post-mortem could be done, during which the netting was removed *in toto* with the surrounding tissues. It is seen that the internal and external tissues have grown through the interstices of the netting, the whole thus forming a solid wall of great strength. According to the report of the assistant

who made the post-mortem, a few loops of intestine had made their way downward alongside the great vessels, but these were found not to be involved in the trouble. Surely, the netting as such had served its purpose; it had enabled the patient—an absolute invalid before the operation—to resume his heavy work for months without wearing any kind of supporter or protection.]

Case II.—Mrs. H. F., aged forty-three years. In 1894 vaginal hysterectomy was performed for myoma by one of New York's gynecologists. Five weeks later, bilateral oophorectomy. After another month, extirpation of left kidney on account of uretero-vaginal fistula. Soon after being out of bed a ventral hernia appeared at the site of the median incision.

Abdominal supporter badly borne. Therefore, radical operation for the cure of the hernia by a well-known surgeon of New York (1898). Good result. One year later, when carrying coal up the cellar stairs, sudden reappearance of the hernia. Further operation refused by a number of surgeons. The patient was first seen by me in February, 1900. Very large irreducible omento-intestinal hernia; aperture about midway between symphysis and umbilicus. Patient demands surgical help.

Operation, March 1, 1900. Dissection of intestines and omentum difficult, as they are matted together by dense adhesions with the parietal peritoneum. Reduction in Trendelenburg's posture. Aperture is round, larger than palm of hand. Autoplasty out of question. In order to shut off the peritoneal cavity the omentum is drawn down tautly and stitched to the parietal peritoneum near the border of the gap by means of numerous interrupted sutures of chromicized catgut. The parietal peritoneum is then closed by a continuous suture on top of the omentum. The remnants of superficial fascia and subcutaneous scar tissue are preserved and stitched together as well as is possible. Continuous suture of skin. Primary union throughout. After six weeks the patient is allowed to get up, and soon after is discharged with abdominal supporter.[1]

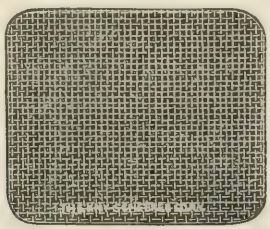
She could rejoice once more over the cure effected, feeling, as she said, like a newborn person, and being well able to resume her former arduous occupation (general housework). However, her happiness was not to last long. In July, five months after the last operation, after a mis-

[1] Shortly afterward she developed an epigastric hernia of small size, directly above the umbilicus, which also was successfully operated upon at the hospital.

take in diet, followed by severe vomiting, she suddenly felt something give way at the hernial orifice. As shown by the conditions revealed at a later operation, the spasmodically contracting stomach had pulled the omentum off the right lower circumference of the hernial opening. When I saw the patient again, in March, 1901, a large hernia had reappeared, causing her great annoyance. In this condition she was presented before the New York Surgical Society (*Annals of Surgery*, 1901, vol. xxxiv. p. 572), with the statement that another attempt at a radical cure with the help of silver wire netting was contemplated by me. This operation was done June 29, 1901, at the German Hospital. Longitudinal incision as before, excising the skin scar. Omentum had torn loose from right lower circumference of aperture. Intestines had pushed forward.

Reduction in Trendelenburg's posture, omentum again stitched to border. That part of parietal peritoneum which formerly represented the hernial sac tears in many places and cannot be preserved. Then, after sufficient undermining of the subcutaneous fat layer, a ready-made silver filigree pad, six by four inches (Fig. 1), (which I procure through the Kny-Scheerer Company, of New York),

FIG 1.



thoroughly sterilized by boiling, is placed upon the defect. It rests upon the omentum and adjoining abdominal wall, where it is stitched to the underlying fascia by a continuous suture of heavy silver wire. After this the fat wound is closed by a few far-reaching deep and a great number of more superficial silkworm-gut sutures. There was no reaction. The upper portion of the wound healed by primary union. In the lower half localized fascia necrosis caused temporary suppuration. Nevertheless the wound closed definitely after a while and has remained closed up to date. In view of her weight (250 pounds), it was thought best to keep the patient on her back for eight weeks. She

then got up, requiring no support, the rupture having been radically cured. The wire pad, while palpable, caused the patient little discomfort. Only on and off she noticed some slightly painful sensation in the region of the scar. On returning home she was obliged to immediately resume her former heavy work, which often severely taxed the firmness of the plate. The latter stood the test well, however, in always successfully resisting the increased intra-abdominal pressure. In the early part of October when washing dishes, standing in front of a low kitchen sink, she struck the region of the protected hernial opening against the corner of the sink. A sudden, intense pain almost made the woman faint. Yet no injury could be detected when I examined her a few days later. Developments since have shown, however, that she must have torn the continuous suture at the time of the accident, causing one of the corners of the well-fastened filigree pad to come loose; for to-day I am able to palpate in the right lower circumference of the original rupture a slight omental protrusion. Nevertheless the patient feels well and experiences little discomfort from this cause. Several attempts to demonstrate the position of the pad on a radiograph were unsatisfactory, probably on account of the patient's immense circumference. (Figs. 2 and 3.) It is my intention to reopen the scar and repair the defect by placing an additional netting *in situ* just as soon as this can be arranged. I confidently expect to see the patient, with a little bit of personal care, at last remain permanently in the same satisfactory condition that the former three attempts at a cure had always been successful in effecting temporarily.

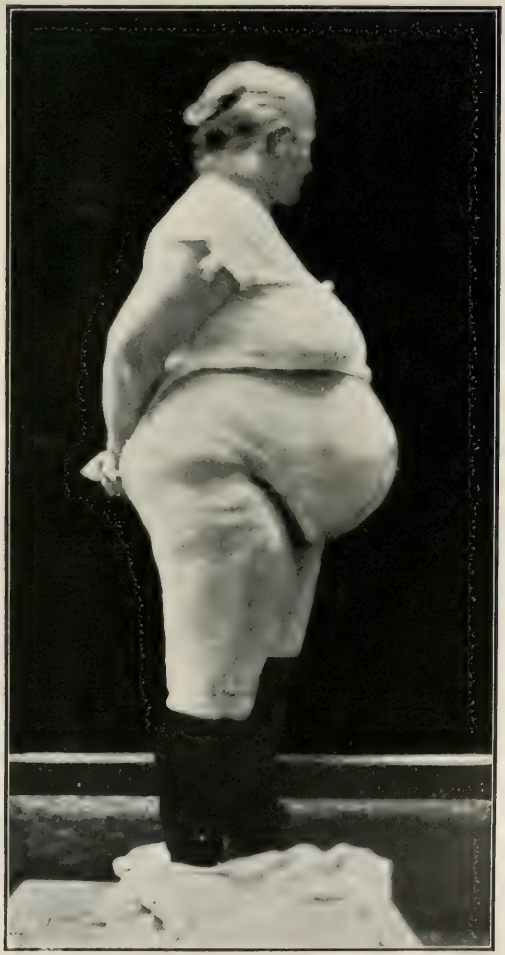
In order to more securely guard patients against harm from such accidents as the one just described I shall in future similar cases fasten the plate by a second continuous suture of wire.

Case III.—Mrs. M. S., aged thirty-one years, nullipara. About a year ago first noticed a reducible small tumor in region of umbilicus. For this she wore an abdominal supporter with a special pad. Within the last week the hernia had become irreducible, hard, and painful.

When first seen by me, March 12, 1902, a tumor the size of a cherry was visible in the region of the umbilicus. It appeared to be an irreducible, inflamed, umbilical omental hernia. Ice and rest soon reduced the inflammation. Reduction, then feasible, showed the neck of the rupture to be about one-half to three-quarters of an inch to the left of the umbilicus, the contents of the sac causing the latter to pro-

FIG. 2.

FIG. 3.



trude considerably. In view of the annoyance attendant upon the wearing of a bandage, and the recent inflammation, in all probability caused by the same, the patient readily agreed to have the proposed radical operation performed. On April 21, 1902, omphalectomy. It was seen that the hernia had been caused by a retraction of the left rectus muscle. Whereas, the right rectus muscle immediately adjoined the median line, the left made a pronounced curve at a level with the umbilicus. In order to carry out Gersuny's operation it would have been necessary to make an incision from the xiphoid process to the symphysis, with extensive dissection of the left rectus muscle; and this, in view of the large amount of adipose tissue (patient weighs 190 pounds) and the tense, unyielding character of the patient's abdomen, did not seem advisable, especially as a satisfactory result seemed by no means ensured by such procedure. I therefore decided upon the implantation of silver filigree. A pad, three and a half by four inches, was placed upon the aperture, which latter was somewhat larger than a silver dollar. Again the omentum was utilized to protect the intestines in the same manner as in the preceding case. Then the two skin fat flaps were reflected sufficiently to make room for the plate. A continuous wire suture was run around the border to hold the netting in place. Wound closed with silkworm-gut sutures; two minute rubber tissue cigarette drains at either end. These were removed on the third day after operation, when the wound was found to have healed by primary union throughout. At the end of the third week the patient was carried home, with instructions to remain on her back for another week. To-day she is entirely well, and so far not annoyed by the heteroplasty.

The foregoing three cases are sufficient, I think, to show that the class of herniæ, formerly considered inoperable on account of the size of the defect in the abdominal wall, are still amenable to treatment by the method just reported. In spite of great intra-abdominal pressure, this artificial, subcutaneous, or submuscular pad does not yield: first, because it is securely held in place by the silver wire sutures, and, second, because the little lobules of fat are pressed through the meshes, and thus the scar tissue below and above becomes a unit with the neighboring tissues.

A most interesting and important feature of this kind of

heteroplasty is the fact that it remains *in situ*, undisturbed, even though the wound should not heal aseptically, or suppuration in consequence of a localized fascia necrosis, etc., should set in.

Witzel observed this fact and calls attention to it. Phelps emphasizes it, and in the event of wound-infection advises "a small incision of the sinus, curetting of the infected portion, and filling of the wound with pure carbolic acid, which is afterward washed out with alcohol."

My first two cases, above reported, also illustrate this point. Evidently the antiseptic properties of silver are responsible for this phenomenon. It places this kind of heteroplasty in favorable contrast with other kinds, as, for example, celluloid, aluminum plates, etc. It represents one of the chief advantages of the method and explains the success that has thus far attended its use in replacing a defect of the lower jaw (C. Hofmann, *Centralbl. f. Chir.*, 1900, p. 1145), or in covering a defect in the trachea (Grosse, *Centralbl. f. Chir.*, 1901, p. 1110), in replacing the diaphysis of the tibia, which had become entirely lost by necrosis (Hofmann, loc. cit.). In localities that can be rendered and kept sterile it has proved of greatest value, as, for instance, in covering a defect in the skull after trephining (A. Gleich, *Centralbl. f. Chir.*, 1900, p. 412); in supporting a movable kidney (Witzel, *Centralbl. f. Chir.*, 1900, p. 1149), etc.

There can be no doubt, I think, that the field of its usefulness will be widened as we gain further experience. I believe, for example, that it would prove of great value in cases where a certain area of the abdominal wall as such, including the parietal peritoneum, had to be excised on account of a tumor (fibroma, fibrosarcoma, etc.). In such cases I think it would be wise, wherever this can be done, to first pull down and stitch to the border of the aperture the omentum—same as I have done it in two of my cases—in order to properly protect the intestines against injury from the implanted foreign substance.

On reviewing the results that have been obtained with silver wire and silver wire filigree in closing large, otherwise intractable hernial apertures, we may well say that this new style of heteroplasty deserves the earnest consideration of every surgeon.

DISCUSSION.

Dr. John M. T. Finney, of Baltimore.

I hardly feel competent to discuss this paper, as I have never seen this method used. I have had experience with several cases of hernia with enormous openings, but I have never yet met one that I could not bring together, although I can conceive how perfectly possible it is to meet such a case. I shall be very glad to try this method. In Baltimore we are not afraid to bury silver in the tissues.

Dr. Meyer, closing: I referred only to large openings in the abdominal wall. There are sometimes cases encountered where the hernial aperture is of the size of the palm of the hand and no other method could help these patients. This condition would be absolutely incurable except by the help of heteroplasty. The implantation of silver wire filigree is a great step forward in the surgical treatment of these cases.

WHY SHOULD WE NOT TREAT THE GALL-BLADDER AS WE DO THE APPENDIX?

By ROSWELL PARK, M.D.,
BUFFALO, N. Y.

The object of the present paper is to invite attention to the resemblances in function between the gall-bladder and the appendix, as well as the similarities between many of the pathological conditions which I would wish to have you interpret as calling equally for radical removal of the organ in question, whichever it may be.

First of all, there are certain resemblances in function and structure between these two appendages. Both of them are hollow receptacles, both more or less tubular in shape and arrangement, both normally contain a certain amount of secretion, and, most important of all, both are essentially superfluous organs, neither of them being necessary for normal purposes of life. The gall-bladder is a reservoir lined with mucosa continuous with that of the intestine. The vermiform appendix is scarcely even to be dignified with the importance of a reservoir, is lined with the same mucosa, and whatever its function may originally have been, it is now almost useless. So long as each of these cavities can discharge itself easily there is little likelihood of trouble. It is when occlusion, no matter whether recurring or permanent, occurs that trouble begins. This occlusion is produced in either case by analogous processes, in which bacterial infection plays a prominent part. Both cavities contain secretion from which calcareous deposits may be precipitated; in other words, in both there is liability to formation of concretions. The amount of pain and disturbance which may be produced by these small stones is, of course, well known to

you and is entirely disproportionate to their size and apparent significance.

Much attention has of late been paid to the toxæmia or stercoræmia which follows retention of appendicular contents. There is a less general appreciation of a perfectly analogous toxæmia which comes from retention of morbid products within the gall-bladder, although I doubt if any man can reflect upon these cases intelligently without recognizing that which has previously escaped his notice. I have had such frequent occasion to be amazed at the degree of toxæmia which may be produced under these circumstances that I wonder that they did not appeal to me in this regard many years ago as they do now.

Further resemblances are seen in that each may become anchored to its surroundings by a variety of intrinsic or extrinsic lesions, and each when so anchored produces a degree of tenderness, of pain, and of disturbance of function which is not always to be measured by the mere density or number of such adhesions. Each in its place, moreover, may lead to coprostasis by interference with the motility of the colon. Each again may cause localized pain and tenderness with acute exacerbations which are a constant menace to the welfare of the individual. Sometimes this tenderness is very easily evoked, and other times it takes deep pressure to call forth the response. Sometimes the enlarged organ can be felt through the abdominal wall, and sometimes it cannot. Still, in either case we may fall back on the general expression of tenderness as a safe sign of disease in the part below.

Just as the appendix when compromised disturbs the function of the cæcum, so does the gall-bladder when involved especially and often disturb the normal action of the stomach and of the pancreas ; and numerous cases of pain, tenderness and associated dyspeptic symptoms, referred primarily to the stomach, are in effect the result of a compromised gall-bladder. Moreover, just as trouble may radiate from the appendix proper and disturb the function of the ovary, or even of the bladder, so may lesions of the gall-bladder completely upset the stomach and

produce such symptoms as to be mistaken for gastritis or gastric ulcer.

This incomplete list of resemblances might be well supplemented by a further statement that in either case, when the part is diseased, it is a constant source of irritation and even a menace to life.

Assuming, then, that the organs themselves and their diseases so completely resemble each other, you will be quite ready for the important surgical question, "Why should we not treat them both alike?" Replying to this self-raised question, I would further say that such is now my custom and my teaching. Whether, then, the case be acute and fulminating, or chronic and growling, I would say that the diseased and troublesome gall-bladder, like the diseased and troublesome appendix, should come out, and that we should now formally include a cholecystectomy as the ideal operation corresponding to appendicectomy. My past year's experience with a relatively large number of these cases has taught me that one is no more dangerous than the other, and is equally satisfactory. I now scarcely think of leaving an evidently diseased gall-bladder, after exposing it, any more than I would think of partial operations upon the appendix. It is in almost all cases not a difficult matter to throw a ligature around the cystic duct near its entrance into the common duct and to extirpate the gall-bladder from the lower surface of the liver, tying off vascular adhesions, and, if necessary, opening the cyst for the purpose of emptying it, in order to make this extirpation more easy. In fact, I sometimes not only open it, but widely, in order that with one or more fingers in the inside I may expedite its separation from the liver or adjoining viscera. This method is now demonstrated to be vastly preferable to the old method of opening and drainage, with too frequent and almost permanent sinuses which remain thereafter.

It is fair to maintain that when the gall-bladder is occluded and contains calculi with old, more or less inspissated or altered mucus, it has ceased to functionate as agall-bladder, is more than useless, and is a source of offence.

When it is thus removed it can no longer furnish calculi which shall cause trouble within the ducts or which shall provoke or irritate the pancreas.

I would repeat again that it is astonishing what a degree of toxæmia can proceed from the contents of an old and occluded gall-bladder. On the other hand, acute gangrenous affections of the gall-bladder are much less common than those of the appendix, all of which is due largely to the variations in their blood supply and anatomical arrangement; nevertheless, even in acute cases of cholecystitis there are exceedingly strong and unmistakable resemblances to acute appendicitis.

So far as the danger of the operation is concerned, I have come to believe that operation on one is scarcely more risky than upon the other, and that there are the same reasons for prompt and early intervention in one case which we meet in the other. Looking back upon my own past experience I am perfectly willing to record my regret that convictions to the above effect had not overcome my prejudices years ago. I have never regretted removing a gall-bladder, and have more than once had cause to regret not doing so. It has now become with me as standard a procedure as removal of the appendix, and seems to me one to be practised with much greater frequency and to be recommended in a large proportion of cases which have hitherto been restrained from coming under surgical management.

SHORTENING OF THE RADIUS IN COLLES' FRACTURE.

By GEORGE RYERSON FOWLER, M.D.,
NEW YORK CITY.

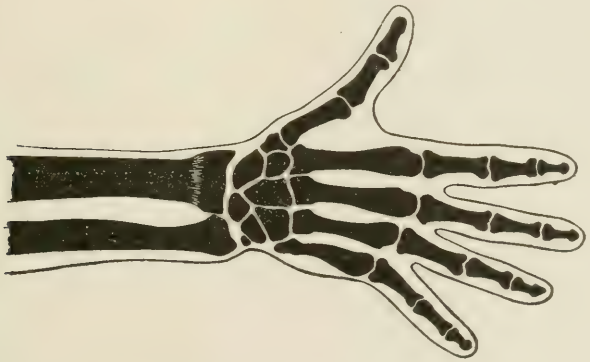
The causes of impacted fracture at the lower end of the radius are those of impacted fracture in general, namely, the application of the vulnerating force in the direction of the long axis of the bone. If the impact is such as to pass in a practically undeviating line through the centre of the cancellous mass forming the lower end of the bone, and the force is distributed evenly, the vulneration takes place somewhere between the point where the impact is first received and the more solid and resisting shaft of the bone.

A fall upon the palmar surface of the dorsally flexed (extended) hand is the common cause of Colles' fracture. The belief that the fracture was always caused by avulsion, the strong carpo-radial ligament offering greater resistance than its bony attachments, only took into account those cases in which the metacarpus and phalanges acted as a lever during forced dorsal flexion (extension), with the carpo-radial ligament as an extension of this lever, and the base of the radius as a fulcrum. Under these circumstances the force is applied through the medium of the lever, and thence through the extension of the latter to the point of least resistance in the line of the applied force, namely, a point close to the anterior surface of the base of the radius.

It is now generally believed that there is no classical Colles' fracture. An injury to the lower end of the radius may consist of a tearing off of a slight spicula of bone by the strong carpo-radial ligament; an avulsion of the entire articular surface by the same mechanism; a fracture with marked displacement

and resulting deformity anywhere between the articular surface and the shaft; or lastly, an impacted fracture, the impaction taking place in such close coincidence with the normal line of the bone that there is practically no deformity of the contour of the latter, the sole displacement being the driving of one fragment into the substance of the other, and resulting shortening.

But to say that there is no deformity of the wrist in these cases of impacted fracture of the lower end of the radius would be far from true. There is a deformity of the wrist, and this is quite characteristic of the shortening of the radius invariably present under these circumstances. This deformity relates more particularly to the lower end of the ulna, and con-



Shortening of the radius from impacted fracture, with inward displacement of the ulna and widening of the wrist.

sists in a diastasis of the radio-ulnar articulation with a relative downward and positive forward displacement of that portion of the bone. The downward displacement is only relative, since, through loss of support of the base of the radius and the action of the muscular structures, the hand approximates more closely to the forearm. As this occurs the ulna is forced to accommodate itself to the new relations of the hand to the lower end of the bones of the forearm. The radio-ulnar ligaments necessarily become either stretched or ruptured in the ascent of the impacted lower extremity of the radius. With the

rupture of the posterior radio-ulnar ligament, and in some instances the internal lateral ligament as well, the ulna is no longer supported in its position, inasmuch as the posterior ligament has its superior attachment to the radius alone, and hence the head of the ulna is forced forward by the impingement of the corresponding portion of the carpus. With the shortening of the radius there also occurs, in addition to the anterior displacement of the head of the ulna, a more or less pronounced radial flexion (abduction) of the hand upon the forearm. Should both the anterior and posterior radio-carpal ligaments give way, as not infrequently happens, inward displacement of the ulna and consequent widening of the wrist follows.

This upward displacement of the lower fragment, whether from impaction or from displacement in one or another of the usual directions, leads to shortening of the radius and consequent elevation of the radial styloid. This is such a constant feature of Colles' fracture in general that it has come to be looked upon as a diagnostic sign of the injury, inasmuch as the normal half-inch difference in the level of the two processes is destroyed. Interference with the function of the hand varies considerably in these cases, but there is always a bar to complete palmar flexion of the wrist. This is sometimes sufficiently pronounced to compel the patient to keep the hand in the straight position, or midway between dorsal and palmar flexion (extension and flexion), or to permit slight dorsal flexion only.

Pain is often a prominent symptom in this class of cases. It is not as a rule confined to the ulnar side of the hand, but is distributed over the latter, and to the neighborhood of the wrist as well. Its presence and disposition are due to pressure upon the cutaneous branch of the ulnar nerve, which communicates with branches of the median nerve. Pain in the entire arm and forearm may result from pressure upon the first branch of the cutaneous, which pierces the deep fascia near the wrist, and gives off a branch almost directly opposite the displaced head of the ulna, and communicates with the internal cutaneous. This symptom of pain in the arm is relatively infrequent, owing

to the fact that this branch of the cutaneous is sometimes absent.

If in the treatment of Colles' fracture sufficient force can be brought to bear to overcome the deformity at once, and pains be taken to maintain the normal position of the ulna by a properly applied pad placed on the palmar side of the head of the ulna, and in addition early massage and movements of the fingers, both active and passive, be employed, the very best results can be obtained in the majority of cases. In the application of this pad it is my habit to use a tightly-rolled portion of an ordinary muslin roller bandage. The pad is about the diameter and length of the little finger. To prevent it from slipping it is covered with a piece of adhesive plaster, folded in such a manner before applying that it presents an adhesive surface to the skin as well as to the roll. An anæsthetic should always be employed in the reduction, and normal length of the radius restored when possible; the ulna is now forced into place, and the roll placed upon the palmar surface to retain the reduction. This is held in place by several turns of adhesive plaster the width of which corresponds to the length of the roll. The edges of the adhesive plaster are nicked to prevent these from sinking into the skin should swelling occur subsequently. The arm is placed in a sling with the hand dependent, so as to maintain the latter in a position of ulnar flexion (adduction).

The dressing above described is essentially that of Moore, of Rochester. It presents the advantages, besides meeting the indications of being always available, of permitting movements, both active and passive, as well as the use of early massage.

In spite of every effort, however, in a certain proportion of cases it will be found impossible to effect complete reduction either of the fracture itself or of the displaced ulna. Upon removal of the dressings the ulna will fall forward almost if not quite to the position which it occupied before its reduction. This usually occurs at once. If it is delayed this delay is due to incomplete repair of the posterior radio-ulnar ligament. Such cases, however, are rare. In the majority of cases the

essential feature of the displacement of the ulna is the shortening of the radius.

In the treatment of cases in which the deformity resulting from failure to reduce the displaced ulna is of sufficient importance, either from the standpoint of impairment of function, the presence of pain, or for reasons pertaining to the presence of the deformity pure and simple, for several years past I have practised removal of the head of the ulna through an incision made along its inner border. The operation is performed subperiosteally, the section of the bone being made by the Gigli wire saw. The amount of bone to be removed will depend upon the amount of impaction of the fragments of the radius, and consequent shortening of the latter.

In cases in which the alignment of the radius is but slightly disturbed, the displacement of the lower fragment being entirely in an upward direction, and this at the expense of its cancellous tissue into which the upper fragment is crushed, this operation will be found to fill all the indications of improvement of function, relief of pain, and correction of deformity. In cases, however, in which the impaction is slight, the shortening being due to either an angular deformity or a bowing of the radius at the point of fracture, it cannot be expected to, nor will it, serve the same useful purpose. Here, nothing short of refracture with, perhaps, cuneiform osteotomy, will completely serve the purpose. There are two symptoms, however, which excision of the head of the ulna will relieve when these are due to malposition of the bone, even though the latter result from failure to reduce an angular displacement at the site of the fracture. I refer to the interference with palmar flexion of the wrist and the presence of pain. The excision of the head of the ulna will remove the obstacle in the case of the former, as well as relieve the pressure upon the nerve structures in the case of the latter. Further, in those cases in which the shortening of the radius is sufficient to produce marked radial flexion (abduction) of the hand, the removal of the head of the ulna, by relieving this distortion, will permit greater freedom of action of the flexors of the fingers.

CYSTS IN CONNECTION WITH THE TEETH.

By JOHN CHADWICK OLIVER, M.D.,
CINCINNATI.

The teeth, particularly unerupted ones, have for years been recognized as etiological factors in the production of neoplasms affecting either the upper or lower jaw; but, in spite of this fact, little attention has been given to the subject by writers upon surgical topics. This lack of literature has perhaps led to misapprehensions regarding diagnosis and treatment, and conservative methods which would result in benefit to the patient have too often given place to uncalled-for radical operations obviously detrimental to the comfort and appearance of the patient.

Case I.—The first case that attracted my attention particularly to this subject was that of Joseph W., a young man, aged twenty-five years. He had had a persistent sinus in the region of the left upper first bicuspid tooth for nine years. He had been operated upon several times for alveolar necrosis, but without benefit. The continued suppuration and accompanying odor distressed the patient beyond measure. He had about made up his mind to adopt the suggestion of one of his physicians—*i.e.*, have excision of the superior maxilla made.

When examined, October 11, 1898, a very considerable thickening and hardening of the maxilla existed in the alveolus between the left lateral incisors and the first molar of the upper jaw. The canine and both bicuspid teeth were absent. The second bicuspid and the canine had been extracted, but no history of the first permanent bicuspid could be obtained. He thought it had never been present.

A large mass of very hard bone presenting a worm-eaten appearance projected beyond the gum in the space mentioned above. A sinus existed at the anterior part, that is, in the region of the socket of the canine tooth. A probe could be inserted into this sinus for one and one-half inches. The probe also showed that the area of necrotic bone was limited for the most part to the superficial portion of the alveolar ridge, and that the body of the bone was not involved. A sinus also opened through the lateral wall of the left nasal fossa. A probe introduced through the sinus in the mouth could be brought into contact with one passed through the lateral wall of the nose. The sinus opening into the nose passed through the bony strictures. There was a localized tender area of fulness just below the inner half of the floor of the orbit.

The patient was free from syphilitic taint, and he had no recollection of any injury to his jaw or face.

The sinuses were reamed out by means of a small, sharp spoon. They led to the point on the anterior surface of the superior maxilla indicated by the area of fulness and tenderness above referred to. A bicuspid tooth, perfect as to crown, but with imperfect roots, was found at the bottom of the sinuses, embedded in the superior maxilla, but anterior to the maxillary sinus. After its removal the parts were thoroughly curetted. The after-history is that of rapid closure of the sinuses and cessation of suppuration.

Case II.—Mary B., aged ten years. An attempt to extract a tooth two and a half years before resulted in the right, lower, lateral incisor being broken off. A short time afterward a painful swelling made its appearance on the alveolar border just to the right of the central incisor. This enlargement was very painful for a time, but this feature soon disappeared. The augmentation of the growth was very gradual.

Examination of the case in May, 1901, revealed a dense fluctuating tumor, bluish in color, with tortuous vessels coursing over it. The alveolar edges had been forced apart by the growth, and absorption of the inner wall had progressed so far as to permit the mass to project under the mucous membrane in the floor of the mouth. The mass was not tender. Fluctuation was evident, the sensation being that of a tense capsule containing fluid. No "crackling" could be elicited by pressure.

An incision under chloroform was made June 4, 1901, at the Presbyterian Hospital. This permitted the fluid to escape and exposed a

reticulated interior—bony spiculæ were found in the partitions. A permanent incisor and canine tooth were found within the sac. Their roots were directed obliquely outward and downward, the crowns projecting inward and upward. The cyst wall extended backward to the proximal surface of the first bicuspid tooth. (The curetting so loosened this as to demand its removal.) A careful examination showed that the bottom of the cyst extended to the neck of the teeth. It did not extend downward upon the roots.

The cavity rapidly contracted and healed under gauze packing and antiseptic washes. The patient has remained well.

Microscopic examination of sections of the cyst disclosed a typical picture of myeloid sarcoma.

Case III. (notes and microscopic sections furnished by H. J. Whitacre, M.D., in whose practice the case occurred).—Emma H., aged twelve years, had a family history of tuberculosis. The patient had been a delicate child. Nine months previous to coming under Dr. Whitacre's observation the patient suffered much pain in the molar teeth on the left side of the lower jaw. The permanent teeth, with the exception of the molars, bicuspid and canine on the left side of the lower jaw, were erupted. These teeth failed to appear, but the gum in the region of the molars increased progressively in size until May 22, 1900, when a tumor, the size of an English walnut, had formed. Dr. N. P. Dandridge operated upon this growth. He removed the mass and some buried teeth. Sections of this growth led the microscopist to the opinion that it was a giant-celled sarcoma.

At a later date, seven weeks before coming under Dr. Whitacre's care, a tumefaction made its appearance in the region of the canine tooth, on the same side of the mandible. The left permanent canine was absent, but its fellow on the opposite side had erupted twelve months previously.

The swelling referred to above was firm. It was located upon the inner side of the lower jaw, extending from the mid-line to the position of the second bicuspid tooth in its long diameter and from the upper to the lower border of the bone. The tumor was about the size and shape of a pigeon's egg bisected longitudinally. The bone was much thickened. The swelling was covered by normal mucosa, was not sensitive, and was very firmly attached. There was no enlargement of the cervical lymphatic glands.

In view of the apparent recurrence after the previous operation the diagnosis was in doubt until an incision revealed a cyst containing a

small amount of fluid and a canine tooth. The tooth projected inward and upward into the cyst cavity. Its crown was well-formed and projected into the cyst to about the same extent that the normal teeth protrude beyond the gum. The root of the tooth seemed to be well formed. The patient recovered rapidly from the condition, and has remained well.

Sections of the mass showed granulation tissue with inflammatory papillæ dipping into the interior of the cyst. It did not resemble the tissue removed at the previous operation.

The history of this class of cases practically began with Christopher Heath's series of masterly articles on the subject, published in the *British Medical Journal* for 1883. These articles were subsequently published in book form under the caption of *Injuries and Diseases of the Jaws*. The author mentions the fact that isolated examples of the affection had been published by Ferguson and others, but he calls attention to the meagreness of the literature upon the subject.

Dr. W. P. Bolles contributed a most complete article upon this affection to the *Boston Medical and Surgical Journal*, September 7, 1871. He may therefore be considered a pioneer in the attempt to elucidate the problems connected with dentary cysts. His observations were confined to cystic growths.

Sir John Tomes (*A System of Dental Surgery*, 1887) was an early and intelligent contributor to the literature.

A proper conception of the pathology of these cysts is unattainable without a careful consideration of the developmental period of the teeth. In one respect, embryology seems to cast much doubt upon the ordinary conception of the pathology and pathological anatomy of these growths. Investigations regarding the developmental period show that one part of the teeth, the enamel, is a direct derivative of the overlying ectodermic epithelium, while the pulp, dentine, and cementum are derived from the mesoderm. In the sixth week of intra-uterine life the epithelial cells upon the surface of the gums multiply and grow downward into the subjacent mesodermic layer in an oblique direction toward the lingual surface of the gum. This ingrowing epithelial (dental) shelf divides into ten indentations,

which become the enamel sacs or primitive enamel germs, the enamel of the teeth being derived from them. The cells between the individual enamel germs disappear, and thus the germs become separated from each other and from the epithelial cells of the surface. In this manner they become true epithelial implantations. Conical projections (dental papillæ) are sent up from the mesodermic layer, one for each enamel organ. These projections are the forerunners of the dentine and pulp of the teeth. The enamel organs and the papillæ grow toward each other, and later the enamel sac caps the papilla. The crown of the tooth alone becomes covered with enamel. The remainder of the enamel organ is found upon the free surface of the tooth for a variable time. It is called the membrane of Nasmyth. The dentine arises from an active multiplication of the mesodermic (connective tissue) cells. The connective-tissue cells upon the surface of the papilla constitute the odontoblasts (modified osteoblasts). Calcification (dentine) begins upon the surface of the papilla, and progresses toward its centre, but it is not complete. The osteoblasts continue the formation of dentine until the dental papilla is entirely surrounded by it. What remains of the papilla constitutes the pulp. During the metamorphosis of the dental papilla the mesodermic tissue immediately surrounding it undergoes slight condensation to form the follicle of the developing tooth. As the enamel organ recedes from the surface the follicle increases to such an extent as to envelop the entire rudimentary tooth. That part of the follicle which covers the future root of the tooth undergoes partial transformation into true bony tissue, and gives rise to the cementum or crusta petrosa, while the unossified external fibrous layer constitutes the lining periosteum of the alveolus. The development of the permanent teeth is precisely analogous to that of the milk teeth. The enamel germs for the permanent teeth, with the exception of the molars, bud from the lingual side of the dental shelf in the seventeenth week, the germ for the first permanent molar appearing about a week earlier at the posterior extremity of the dental shelf, after the manner of a milk tooth. The germ

of the second molar buds from the neck of the first molar in the third month after birth, while that of the third molar springs from the neck of the second about the third year. At birth, therefore, the gums contain the two sets of teeth, except the second and third permanent molars. (This account of the embryology of the teeth is taken almost bodily from Heisler's text-book of embryology.)

All writers upon this subject seem to agree in believing that cystic growths connected with the teeth may be of two varieties—*i. e.*, cysts connected with the roots of the teeth, and those connected with the crown of the tooth or several teeth. Much confusion has existed in the matter of classification, because various writers have assumed that all cysts of the jaws have a common point of origin. Eve (*British Medical Journal*, Jan. 6, 1883) makes the statement: "I think all the tumors belong to the same group, the individual specimens presenting only differences in degree of development."

Broca (*Traite des Tumeurs*, vol. ii. p. 35) declares that "the great majority of cysts of the jaws have their origin in tooth follicles."

Magitot (*Arch. Gen. de Medecine*, 1872–73) describes cysts of small size in connection with the fangs of permanent teeth. He gave these the name of periosteal cysts.

Sir John Tomes (*A System of Dental Surgery*) divides dentary cysts into two varieties—those connected with the crown and those connected with the fangs of the teeth.

In view of the method of development of the teeth it seems highly probable that two varieties may develop—one of ectodermic and the other of mesodermic origin. The former should contain epithelial structures, while the latter should not.

J. Bland Sutton (*Tumors, Innocent and Malignant*, 1893) groups all of the neoplasms connected with the teeth under the "odontomata," and classifies them according to the anatomical elements entering into the formation of the teeth—his grouping may be said to be based upon the embryology of the teeth, and hence follows the correct method. According to this author the following classification is the correct one:

1. Epithelial odontome—from the enamel organ.
2. Follicular odontome.
3. Fibrous odontome.
4. Cementome.
5. Compound follicular odontome.

} From the tooth follicle.

6. Radicular odontome—from the papilla.
7. Composite odontome—from the whole germ.

The vast majority of examples of this affection occur in patients under thirty years of age. Statistics seem to bear out the statement that cystic growths occur at or shortly after the period when the affected tooth should, under ordinary circumstances, be erupted. The third molars on the lower jaw are relatively more frequently affected than any of the other teeth —this is probably due to the fact that they are commonly the last teeth to make their appearance. The canines, usually erupted about the twelfth or thirteenth year, are the next most frequently involved. The incisors, first and second molars, and second premolars are the seat of trouble in about equal proportion. The first premolars are least frequently affected.

These growths occur with about equal frequency in each jaw —possibly the mandible is somewhat more apt to be involved, but not distinctly so. As these growths almost invariably occur in connection with permanent teeth (one connected with a temporary molar is mentioned by Mr. Salter as occurring in the practice of Mr. Alex. Edwards) it may be assumed that there may be a causal relation between their development and irritation in their vicinity at or about the time for their eruption. The mere retention of a permanent tooth within the substance of the jaw after its regular time for eruption, or even its permanent retention, does not seem to be an etiological factor of much importance. It is not at all unusual to find families in which certain teeth of the permanent set fail to erupt at all, and it is curious to note the uniformity of this deficiency in the various members. For instance, I know a family in which for four generations several of the members in each generation failed to have the upper permanent left lateral incisor and canine teeth appear. An examination, however, proves these teeth to be

present in the jaw, but unerupted. None of the members of this family have ever been afflicted with any growth connected with these teeth. They have almost without exception retained the corresponding deciduous teeth until after they were thirty years of age.

Dentigerous cysts have occasionally been found in connection with a supernumerary tooth. (Eugene Talbot, *Chicago Medical Journal and Examiner*, Feb., 1882. Christopher Heath refers to another similar case reported by Mr. C. J. Fox.)

Sir William Ferguson reported a case of dense osseous tumor of the upper jaw, which, upon section after removal, proved to contain a tooth embedded in its centre. Dr. P. S. Conner has in his possession a beautiful specimen of the same nature. I had hoped to be able to present this specimen, but it has been mislaid.

Cysts and tumors have also been found in connection with imperfect teeth.

Misplaced and inverted teeth have been the apparent starting point of neoplasms and cysts.

As a general rule but one tooth is found within these cysts, but, very rarely, two teeth may be included. The second case reported in this paper is an example of this rare condition.

But little is known of the exciting causes of this condition. Mr. Tomes explains the formation of cysts in connection with retained teeth by referring to the fact that "when the development of the enamel of the tooth is completed its outer surface becomes perfectly detached from the investing soft tissue, and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid ordinarily is discharged when the tooth is cut; but when, *from some cause*, the eruption of the tooth is prevented it increases in quantity, gradually distending the surrounding tissues in the form of a cyst."

More remarkable and more unsatisfactory is the explanation given by Mr. Heath that "dentigerous cysts arise in connection with teeth which, *for some reason*, have remained within the jaw and have undergone a *certain amount of irritation*."

Several other explanations are possible, for instance:

1. Misplacement of the dental germ, either in reference to position and depth in the gum tissue or in reference to the axis of embryonal development and embryonal forces.

2. *Embryonal Rests.* The neck of the primitive bud that springs from the primary enamel germ for the development of the permanent tooth may persist and develop cysts in definite relationship to the crown of a fairly well-developed tooth. Such a process is entirely analogous to the rests of the ovary which are left after the infolding of the germinal epithelium and which are responsible for the cystadenomata of the ovary. (Valentin-Pflüger ducts.)

3. *Failure in Evolution.* (*a*) The membrane of Nasmyth may become unusually thick and tough and fail to resorb. This may occur with a normally placed follicle, but more particularly when the axis is misplaced and it lies in an oblique, transverse, or reversed position. (*b*) The wall of the follicle is unusually dense and resistant, giving rise to a similar series of changes to the above. (*c*) A general or partial jumbling of the enamel and dental papilla at the time of their formation may take place.

4. *Irritation.* (*a*) The proliferative activity of the cells concerned in the evolution of the teeth, by reason of displacement, does not meet with the normal juxtaposition and arrangement of cell force and interaction that are believed to be requisite to the normal histological arrangement of cells in their development. This results in a proliferative activity on the part of the cells of the dental papilla; or, as occurred in the three cases reported, and as most often occurs, the surrounding periosteal and their connective-tissue structures undergo proliferation. The histological structure of the tissue found in the cysts reported is that of giant-celled sarcoma, but they are not sarcomata. They are composed of connective tissue which has reverted to an embryonal or granulation-tissue type under the influence of prolonged irritation. (*b*) The mechanical irritation by an obliquely or transversely placed tooth crowding into the side of an elveolar border may certainly give rise to the same irritative changes that have just been described, and may also explain the three cases reported. The interior wall of the cysts in Case

III. showed typical granulation tissue. This irritative change is analogous to that found around encysted bullets or other foreign bodies.

M. H. Fletcher, M.D., D.D.S., of Cincinnati, suggests the following ideas in regard to the pathology of this affection. "At the time of the eruption, when teeth are normal in shape, position, and time, they are never complete in length and shape of the root, nor are they complete until long after the crowns have been entirely exposed and put into use. This incompleteness consists in the root being short and funnel-shaped instead of pointed. The large end is directed into the tissues about them, and is sharp like a gunwad punch. This is true of all human teeth. The molars may be compared to a thimble, with a sharp lower edge pushed into the soft embryonic tissue when pressure is brought to bear upon them. At this age of life bone tissue is comparatively soft and incomplete. This is especially true of the face and jaws. On the other hand, long before a tooth is erupted the enamel is hard and complete and the enamel organ has disappeared save for its remnant in the form of Nasmyth's membrane as a film over the outside surface of the crown. The enamel at this time is practically as hard as it ever will be, and its edges are thin and sharp. The formation of dentine is upon the inside of this enamel cap, and its incomplete edges are also sharp until the apices of the roots are formed. And this does not normally occur even in the incisors of the milk set until about the fifteenth or eighteenth month after birth, the last of the milk set not being completed until the twentieth to the twenty-fourth month. In the permanent set the first to mature are the first molars, about the ninth year. The last of the permanent teeth are not completed until near the twentieth year. Thus it is seen that at all times between the ages of one and a half and twenty years there are from four to twenty teeth in good condition to produce irritation of all degrees. Between the ages of six and fourteen there is the greatest number, and it is between these ages that the disease under discussion most frequently appears. To produce irritation it is only necessary to have sufficient pressure or a stroke

hard enough to force one of these uncompleted teeth into the tissues below them, and this may easily occur when a tooth is far enough developed to have penetrated the bone above its crown and yet not to have perforated the flesh. At this age the only real attachment the tooth has is a narrow ring of the root just below the finished edge of the enamel. This attachment is often not wider than a sixteenth or an eighth of an inch. As the tissues below it are soft, the bone not having formed excepting a slight ring at the neck, to which the thick, elastic peridental membrane is adherent, it is evident that this attachment could easily be ruptured by downward pressure. This lateral attachment will, of course, be greater after the tooth has erupted, but then the facilities for injury are also increased because the crowns protrude and are being used. Pressure upon the teeth and alveolar ridge from mastication is brought to bear many times a day, and it is easy to imagine that inflammation once started may be so continuous that the surrounding embryonic tissues could be excited into the production of new-growths of a connective-tissue nature. From continuity of tissue it would seem perfectly easy for the dental follicle of the neighboring tooth to become inflamed from irritation of one that has erupted."

These explanations are good so far as they go, but they fall short of the real explanation of the cause of the failure of the tooth to erupt. Rachitis has been given as the possible cause of the failure of the teeth to form perfectly and erupt. Analysis of the reported cases would seem to give some strength to this view, because many of the teeth found in these cysts are imperfect so far as the roots are concerned. Since the cementum, which completes the roots, is very similar in its nature to bone, one can readily see how a failure of bone products in rachitis might have a very important bearing upon the retention of the teeth.

In order to test this idea, sections of the various teeth taken from cysts of this character have been made, but the results failed to show any uniformity in regard to the amount and character of the deposit of cementum. This would seem

to negative the idea that the increasing deposit of cementum is what causes the tooth to erupt.

The real question in the pathology of this affection hinges upon the non-eruption of the tooth. It is not difficult to conceive how a retained tooth will produce irritation, but there does seem to be great obscurity in regard to the causes which produce the eruption of the tooth.

Theoretically, cysts of epithelium and of connective-tissue formation should be found, the former arising from the enamel organ, and the latter from the tooth follicle. Various observers have corroborated this theoretical prophesy, and have classified the cysts accordingly.

Sutton says: "Histologically an epithelial odontome consists of branching and anastomosing columns of epithelium, portions of which form alveoli, the cells occupying the alveoli varying, the other layer being columnar while the central cells degenerate and give rise to a tissue resembling the stratum intermedium of an enamel organ. They probably arise from persistent portions of the epithelium of enamel organs."

Mr. Baker (*Transactions of Tenth International Congress of Medicine*, Band v., Abth. 14, p. 103) reports a case with cysts attached to the palatine and posterior buccal roots of a left upper, first molar tooth. "The one on the posterior buccal root exhibited the usual structure of these growths, viz., an outer, thicker layer of fibrous tissue with elongated cells evidently derived from the root membrane, a middle layer consisting of rounded, nucleated cells arranged in irregular rows, with a felted arrangement of fibres between and an internal layer of granulation tissue in which some thin-walled blood-vessels were to be seen, and, in the centre of the granulation tissue, a cavity which contained a small amount of pus. None of the sections exhibited epithelium. It was, therefore, purely of mesoblastic origin. The other cyst was similar in composition to the former one except that 'on the granulation tissue stood a double row of *columnar ciliated* epithelium.'"

This observation is entirely at variance with all others with the exception of one reported by Dr. Rothman. The almost

universal opinion is that epithelium is not found in cysts connected with the roots of the teeth.

Mr. Eve (*British Medical Journal*, 1883) holds that the epithelial lining of such cysts may be due to an ingrowth from the epithelium of the gum.

The recognition of the real nature of these growths rests very largely upon the four following points: First, absence of a permanent tooth without any history of its removal after it should have been erupted. Second, the cystic nature of the growth. Third, the crackling sensation of the thin bony cyst wall when pressed upon. Fourth, exploratory incision.

The development of a cyst at or near the time for the eruption of a permanent tooth may be of value in diagnosis, as may also the slow increase and painless development of the neoplasm. "Crackling" is by no means a constant symptom, and is inferior in diagnostic import to tapping or incision. In any case of cyst connected with either jaw incision of the mass should precede excision of a part or all of the jaw. This conservative measure does not interfere with the radical one, and may frequently obviate any mutilating procedure.

The prognosis is uniformly good, both as to the life of the individual and from an esthetic point of view.

The evacuation of the cyst, removal of the tooth, thorough curetting of the interior, with subsequent packing of the cyst cavity, is the proper procedure in all cysts connected with the teeth. This mode of attack will certainly remove the growth, as well as the cause of it. Cysts in connection with the teeth never require removal of osseous structures in order to bring about a cure. Of course, one can imagine the implantation of a malignant growth upon one that was originally benign, but the literature on the subject does not record an example of such transformation.

AN OPERATION FOR THE RADICAL CURE OF ANEURISM BASED UPON ARTERIORRHAPHY:

With the Report of Four Cases Successfully Operated upon by the Author.

By RUDOLPH MATAS, M.D.,
NEW ORLEANS.

I.

The radical cure of aneurism as classically described embraces two distinct procedures: (1) The old operation of Antyllus, in which the sac is left *in situ* after evacuation of the contained clot and ligation of the proximal and distal ends of the main artery outside of the sac, and (2) Purmann's operation, also attributed to Phillagrius, in which the sac is extirpated *in toto* or in its greater part. Numerous modifications of these procedures have been suggested at various times and by different operators, which affect details of technique, but do not alter the fundamental principles of these methods. In the original procedures, as well as in their subsequent modifications, from remote antiquity to the present time, the ligature has been relied upon almost exclusively as the hæmostatic agent to arrest the circulation in the sac and to control the bleeding from the artery which feeds the aneurism.

In the operation described in this paper, the sac is, as a rule, not extirpated or disturbed, except in so much as is required to evacuate its contents and freely expose its interior, and in this way it may be regarded as a derivative of the old Antyllian operation. Apart from this it differs essentially from either of the

classical procedures in the fact that no ligatures are applied to the main artery, and that the circulation in the sac is arrested, and hæmostasis is secured, solely by suturing the arterial orifices found in the interior of the sac. Again, in suitable cases—that is, in the true sacciform aneurisms with a single orifice of communication with the parent artery—this method will allow the operator to obliterate the aneurism without obstructing the lumen of the artery or interfering with the circulation in the injured or diseased vessel—a great desideratum which should never be lost sight of when operating upon this class of cases.

Finally, it differs essentially from the Antyllian operation in the fact that the cavity of the sac is not simply packed or drained and left to heal by granulation, but is at once obliterated by inverting or infolding the walls of the sac with the attached overlying skin. The flaps thus formed are sutured to the bottom of the cavity, so that no dead spaces are left to suppurate or favor secondary complications.

The operation now proposed by the writer is applicable to all aneurisms in which there is a distinct sac, and in which the cardiac end of the main artery can be provisionally controlled. It is especially applicable to all forms of peripheral aneurisms of the larger arterial trunks (carotid, axillary, brachial, iliac, femoral, and popliteal); and, while the author has had no experience with similar lesions of the large visceral trunks, the principle suggested would appear to be applicable to abdominal, aortic, and other accessible forms of abdominal aneurisms. It is particularly indicated in the treatment of traumatic aneurisms in which the wounded artery communicates with a well-developed and circumscribed sac, and in all fusiform and sacculated aneurisms, whether traumatic or idiopathic, in which the conditions for securing provisional hæmostasis can be obtained. The method proposed does not contemplate the treatment of arterio-venous aneurism and the circumscribed or diffuse pulsating hæmatomas of recent origin, which result from arterial and arterio-venous injuries. These cases offer admirable opportunities for the conservative application of arteriorrhaphy, with the view of preserving the lumen of the injured vessel, and thus

maintaining their functional value as blood-carriers. Notable illustrations of the value of arterial and venous suture in cases of diffuse traumatic aneurism, or, rather, pulsating hæmatoma, are the cases of simultaneous injury of the common femoral artery and vein, reported by Murphy,[1] of Chicago, in 1897, and by Cammaggio[2] in 1898. Murphy's case is especially notable as the first on record in which an artery was successfully united by suture after circular resection of the injured area. The reported cases of fully established arterio-venous aneurisms treated by separate suture of the openings of the arteries and veins are few, thus far; but those reported by Zoege von Manteuffel[3] (1895), Gerard Marchant[4] (1898), and Peugniez, of Amiens[5] (1900), are examples of the growing appreciation of arterial suture in the treatment of this class of aneurismal injuries. In these cases, as in the more frequent simple wounds of arteries, the technique adopted is that of angiorrhaphy, or the suture of comparatively normal arteries, and is subject to the rules which govern the application of this procedure. The anatomical and operative conditions, however, differ so radically from those met

[1] Medical Record, New York, January 16, 1897.
[2] Riforma Medica, 1898, vol. iv., No. 125.
[3] Berliner klin. Wochenschrift, 1895, No. 34.
[4] Bulletin Société de Chirurgie, Paris, July 6, 1898.
[5] Gaz. méd. de Picardie, Amiens, 1900, xviii. pp. 16–23 and 85–93.

NOTE.—Including the above-cited cases of arterio-venous injury, the author has collected thirty cases of suture of the arteries alone in which the vessel had been sutured by either lateral or circular arteriorrhaphy in the human subject. One of the cases included in this compilation occurred in the author's practice while this paper was being revised for the press (November 7, 1902). The axillary artery was injured while extirpating an adherent lymphosarcoma from a woman aged fifty-eight years. The rent in the artery was closed with four lateral silk sutures which did not penetrate the lumen of the artery. The vessel was considerably reduced in calibre at the seat of suture, and the pulsation was faint at the wrist, but in a few minutes it improved, and finally regained its normal fulness. The circulation of the arm was unimpaired and the wound healed *per primam;* hæmostasis was perfect.

The reader interested in the bibliography of arteriorrhaphy and in the collective reports of cases will find valuable information in the following recent contributions: G. Tomaselli, La Clinica Chirurgica, Milano, June 30, 1902, Anno x., No. 6; Hubbard, Boston Medical and Surgical Journal, March 27, 1902; W. Korte, Archiv. f. klin. Chirurgie, 1902, Band lxvi. pp. 919–637; Salinari and Virdia, Giornale del R. Esercito, Roma, 1902, Nos. 4 and 5.

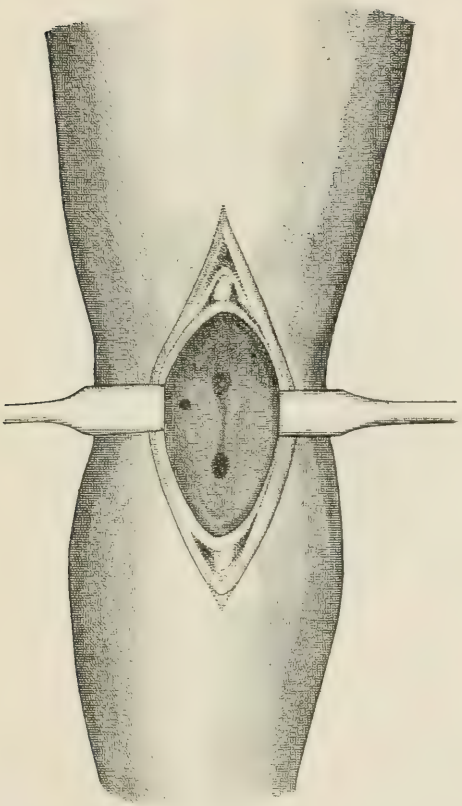
in the fully-developed aneurismal tumors, which are the subject of discussion in this paper, that it would be digressive and unnecessary to dwell upon them further on this occasion.

II.

The principles which underlie the technique of the author's operation are very simple, and are based upon a few well-established histological and pathological data which need be only briefly mentioned in order to grasp the rationale of the procedure and to adapt it to the variations that are met in practice. The dominant and essential feature of the operation is that the aneurismal sac is regarded as a large diverticulum or prolongation of the parent artery with which it is connected; that the lining membrane of the sac is a continuation or expansion of the endothelial intima which lines the interior of the artery, and in fact of the entire vascular system, and that the sac itself, when not disturbed from its vascular connections is capable of exhibiting all the reparative and regenerative reactions which characterize the endothelial surfaces in general when subjected to irritation. In other words, the sac when fully formed and developed is the analogue of the serous cavities elsewhere, not only in a histological and physiological sense, but from a surgical point of view is to be treated as a serous cavity, comparable to the peritoneum, pleura, pericardium, dura, etc. In the orifices of communication which open into the sac and in the contiguous marginal areas, the identity of structure of the aneurismal sac and the parent artery is more fully confirmed and pronounced. The classical division of the sac into two types—the true and the false—which has so long obtained in pathology is simply intended to indicate the preponderance or absence of the original arterial tunics in the composition of the sac. In all cases the absence of the media, with its elastic elements, is the characteristic feature of the sac. In the fusiform aneurisms of pathological origin (so-called spontaneous or idiopathic aneurisms) the sac walls essentially represent a continuation of the pre-existing

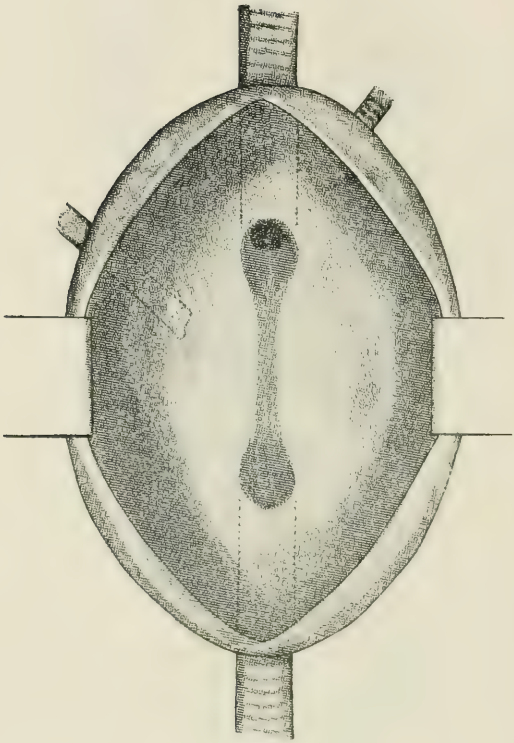
coats of the artery, *minus* the media, which is lost and cannot be recognized beyond the margins of the aneurismal orifices; the fibrous adventitia and endothelial intima are continued as extensions of the pre-existing coats of the parent artery. In the fusiform or saccular aneurism caused by direct injury to the artery (gunshot, punctured, stab, and other wounds) the sac is in its major part an adventitious product of new formation, in which, however, the newly-formed elements resulting from connective-tissue proliferation have assumed the fibrous and endothelial characteristics of the adventitia and intima of the parent artery. It follows from all this that, whether the sac be of purely traumatic or pathological origin, it can be regarded for surgical purposes as a prolongation or expansion of the affected vessel and, as such, is amenable to the same pathological reactions which characterize the normal bloodvessels when subjected to irritation. The absence of the elastic fibres of the media, which is so significant from the pathogenic point of view, is of no consequence to the surgeon, who is chiefly concerned when performing this operation in finding tissues that are capable of displaying sufficient reactionary and regenerative qualities, so as to obliterate the sac and its orifices when brought in close contact by sutures. These necessary plastic conditions are found in the smooth inner lining tunic of the aneurism which, as previously stated, is continuous with the intima of the arteries. In the larger and older aneurisms the inner surface of the sac loses, in places, its smooth, serous surface, but the identity of the endothelial intima is lost only in the distant and peripheral parts which are not in contact with the blood current, and where fibrinous deposits cover the altered and exposed basal membrane in the form of laminated clots. But even in these cases the orifices and their marginal areas for a considerable distance beyond retain the glistening, polished appearance characteristic of the endothelial layer of the intima. As the endothelial lining of the arteries and vascular system in general is a serous membrane of mesoblastic derivation like the peritoneum, pleura, etc., it manifests the same reactionary tendencies displayed by the serosæ when subjected

FIG. 1.



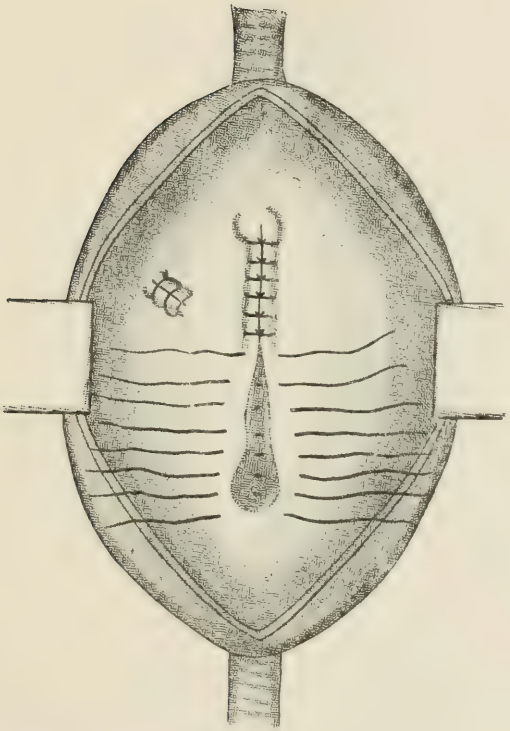
Aneurismal sac, fusiform type, with two orifices, as seen *in situ*, in the popliteal space. After controlling the circulation with the elastic constrictor the sac is exposed by dissection without disturbing it from its bed. A longitudinal incision is made from one pole of the tumor to the other. The edges are retracted, the clot removed, and the bottom of the cavity is exposed, irrigated, and made ready for the suture of the orifices seen in floor of the sac. The smaller opening of one collateral is shown on the right side.

FIG. 2.



Interior of large aneurismal sac of the fusiform type exposed by retraction. The two openings lead respectively to the parent trunk on the proximal (cardiac) and peripheral sides, and the groove between them represents the continuity of the arterial walls blending with the aneurismal sac. This was the type of sac observed in Cases 1, 2, and 4, reported in the text. The orifice of one collateral or branch originating in the sac is shown, and a large collateral opening into the main trunk near the orifice of communication, on the cardiac side, is indicated by the dotted line.

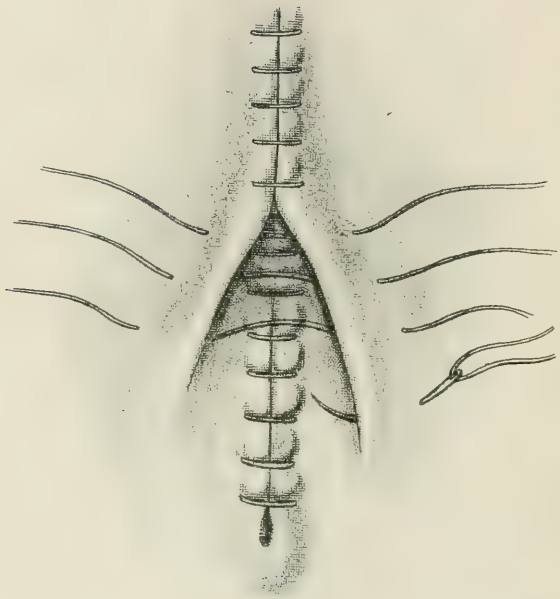
FIG. 3.



Shows the orifices in the aneurismal sac in process of obliteration by suture. The first plane of sutures may be made with fine silk, but chromicized catgut is preferred. The sutures are applied very much like Lembert's sutures in intestinal work; the first plane of sutures should be sufficient to secure complete hæmostasis.

The orifice of the collateral vessel on the left upper side of the sac is shown closed by three continued sutures.

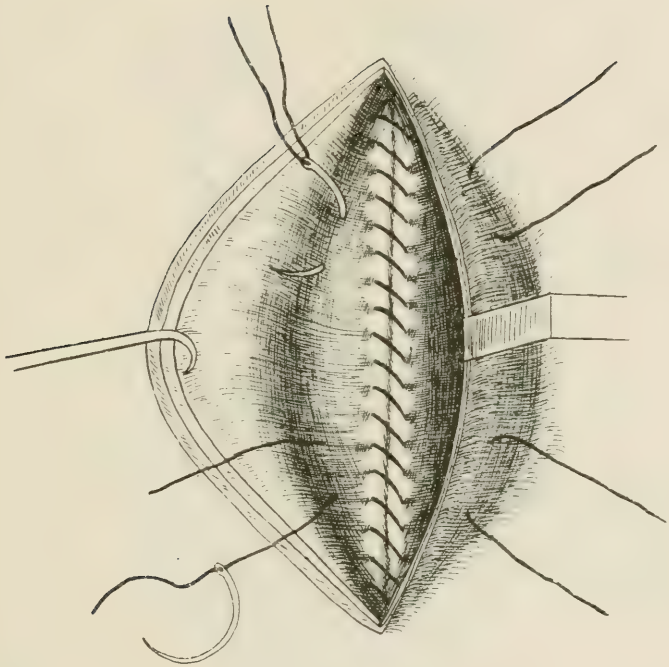
FIG. 4.



This shows a second row of sutures—a technical detail of the operation which is advantageous, but not necessary in every case.

The first row of sutures has been completed and the arterial orifices have been obliterated. As the walls of the sac are usually relaxed, it is easy to insert a second series of sutures which add security to the first row, and, in addition, reduce the size of the cavity which is to be obliterated by inversion of the skin and surplus sac walls at a later stage in the operation. This second row of sutures is applied as in the first series, by either the continued or interrupted method, with a curved needle, and No. 1, 2, or 3 chromic catgut. A large surface of the sac is thus brought in apposition, and the best opportunity given for adhesion by plastic or exudative endo-arteritis. If the floor of the sac is rigid or too adherent to the underlying parts, this second row may be omitted, and the operation can be advanced to the last step, *i. e.*, obliteration of the sac after suture of the orifices.

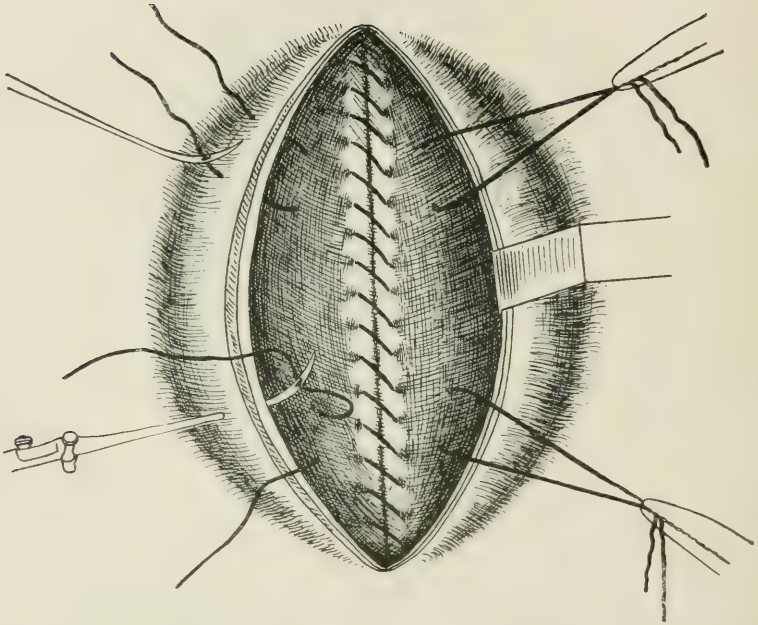
FIG. 5.



Shows the details of the method of obliteration after the floor of the sac has been raised by the second row of sutures. Two deep supporting and obliterating sutures of chromic catgut are inserted through the floor of the sac on each side. The number of these sutures will vary according to the size and length of the sac that is being treated. In the smaller aneurisms, one of the deep sutures on each side will suffice; in others, two or more on each side may be required to keep the surfaces in close contact. After the sutures are passed through the floor of the sac the free ends of the threads are carried through the entire thickness of the flap by transfixion.

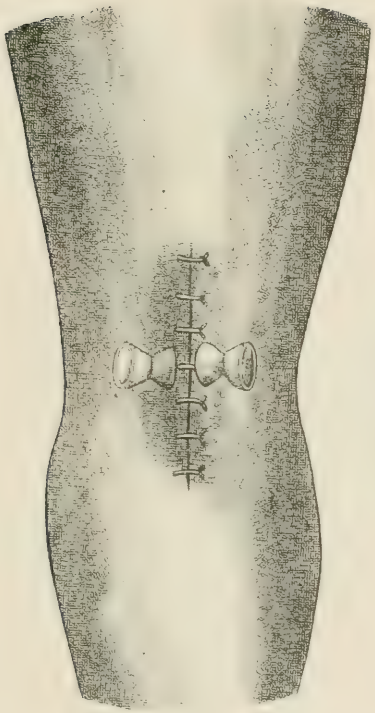
The plate shows the mode of placing these sutures on the left side preparatory to transfixion of the flap. The two sutures on the right side have been carried through a flap and are in position.

FIG. 6.



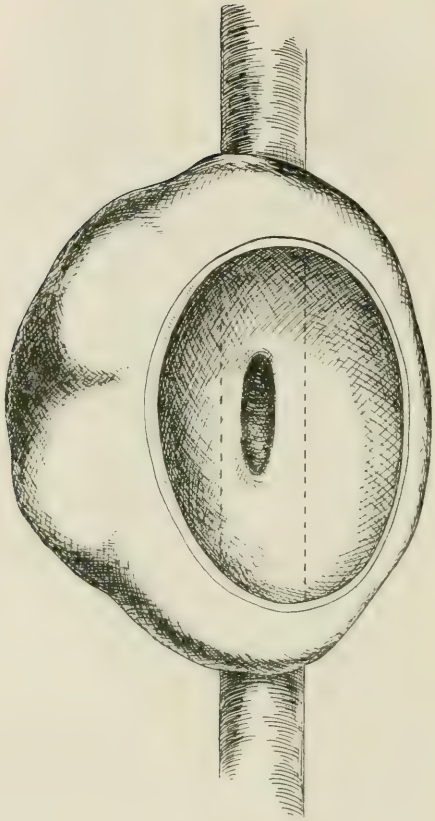
Shows the deep supporting sutures in position and the details of transfixion of the flaps. The Reverdin needle is used to carry the free ends of the threads through the flaps formed by the skin and aneurismal walls.

FIG. 7.



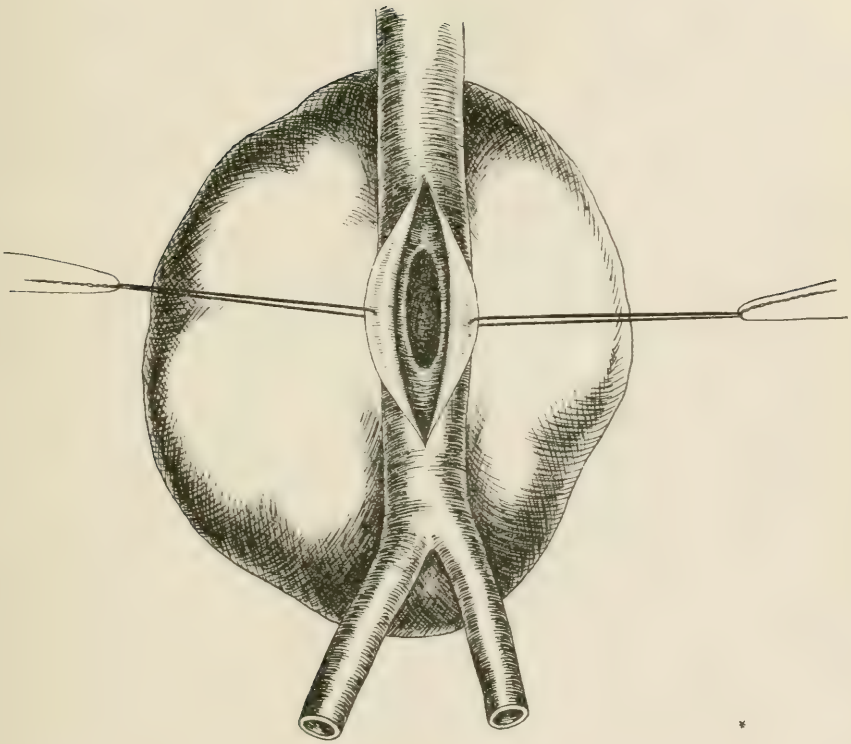
Shows the operation completed. In this figure only two supporting sutures are shown on each side instead of the four shown in the other figures. The skin and sac walls form two lateral flaps on each side of the incision, and readily fall to the bottom of the sac, thus lining and obliterating the entire cavity. A series of interrupted absorbable sutures are now placed so as to bring the edges of the skin in contact, several of these including the floor of the sac in their bight (as shown in cross section, diagram No. 13), so as to close the space entirely in the middle line. The two lateral supporting sutures are tied firmly over small pads or rolls of sterile gauze, thus bringing all the interior of the sac in apposition.

FIG. 8.



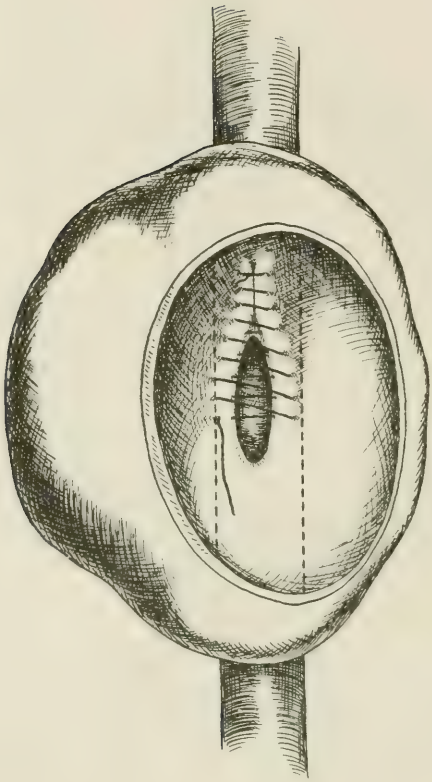
This shows a typical *sacciform* aneurism with one main orifice of communication opening into the sac. In this type of aneurism the lumen of the parent artery is maintained. It is possible in this class of cases to close the orifice of communication by suture without obliterating the lumen of the artery, and without interfering with the circulation in the main artery or of the distal parts supplied by it.

FIG. 9.



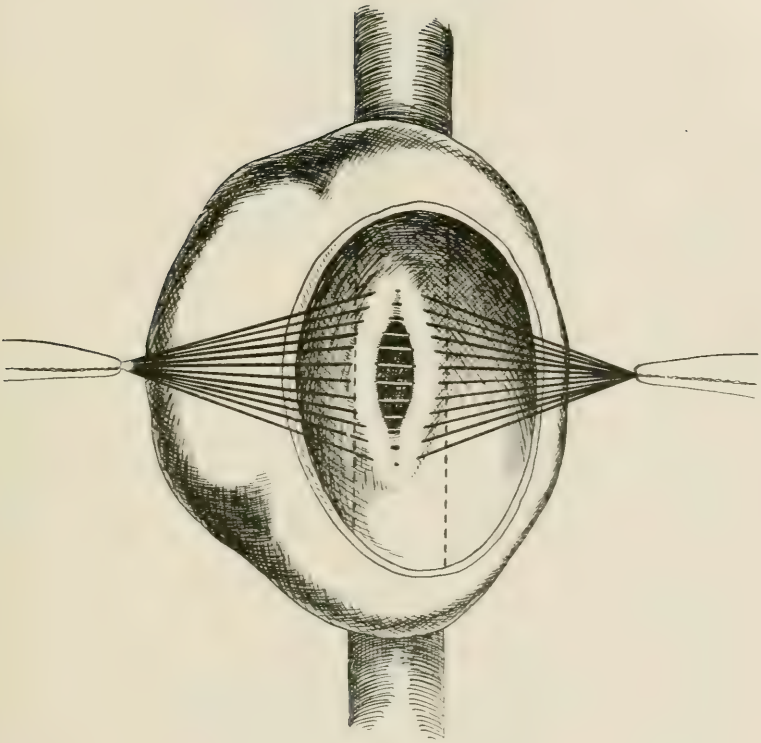
This figure is simply intended to show the same type of sacciform aneurism, viewed from the posterior side. The parent artery is continuous throughout, and is simply attached to the sac at the orifice of communication. The artery has been laid open on its posterior surface, showing that the orifice of communication can be closed on the aneurismal side, without occluding the lumen of the parent artery. The drawing is taken from a pathological specimen, and is utilized solely to show the favorable anatomical characteristics of this class of aneurism for the conservative procedure suggested by the author.

FIG. 10.



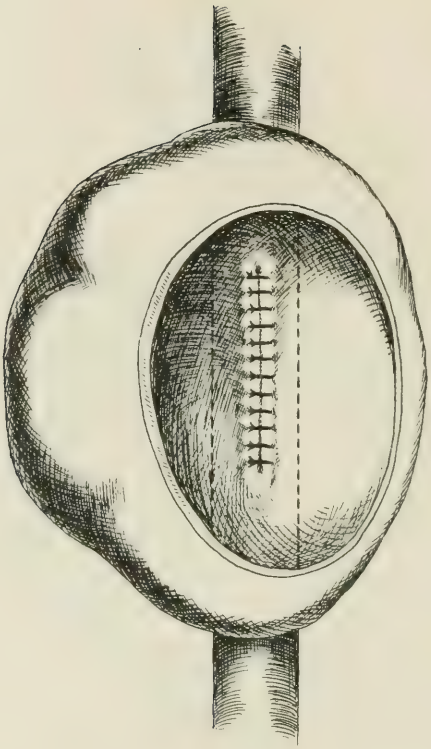
Shows the same sac opened. The dotted lines indicate the position and relations of the main artery to the sac and to the orifice of communication. The object of the operation in this case is to close the orifice of communication without obliterating the main artery. The closure of the orifice with continued suture is shown in the plate.

FIG. 11.



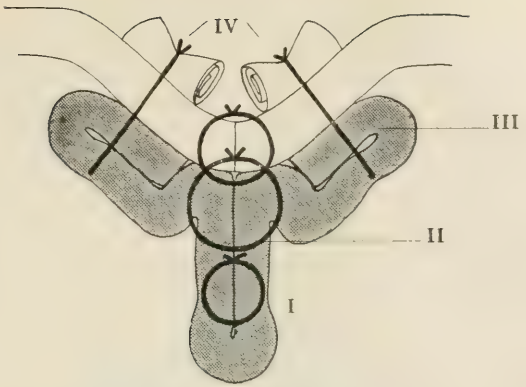
This shows the closure of the orifice of communication in the same type of sac with interrupted instead of the continued suture. Whether the continued or the interrupted suture be used (the former being preferred by the author), it is important the suture line be some distance from the orifice, so as to infold a considerable surface of the sac at the start; then care must be exercised to insert the sutures so as to grasp a considerable surface of the margin, in a manner that the point of the needle shall penetrate the entire thickness of the margin, and yet not so far within the lumen of the artery as to encroach upon its calibre or to leave the suture material in contact with the blood current. When the sutures are tightened they should bring the marginal surfaces in broad apposition without projecting into the anterior portion of the artery or encroaching excessively upon the lumen of the vessel.

FIG. 12.



Shows the obliteration of the orifice of communication completed. The appearance following the application of interrupted suture is shown in this figure. If the suture has been properly applied, the hæmostasis will be complete, and the circulation in the main artery restored. After this has been done, the second protective row of sutures shown in Fig. 4 and other details of the technique of the obliteration of the sac (shown in Figs. 5, 6, and 7) should be carried out precisely as in dealing with aneurisms of the fusiform type. Anomalous orifices or collaterals opening into the sac, in addition to the main orifices, are less liable to exist in the sacciform aneurisms than in the fusiform aneurisms, in which a large area of the arterial wall is involved. In any event, however, should such additional orifices exist, they should be individually closed by a few continued sutures, as shown in Fig. 3.

FIG. 13.

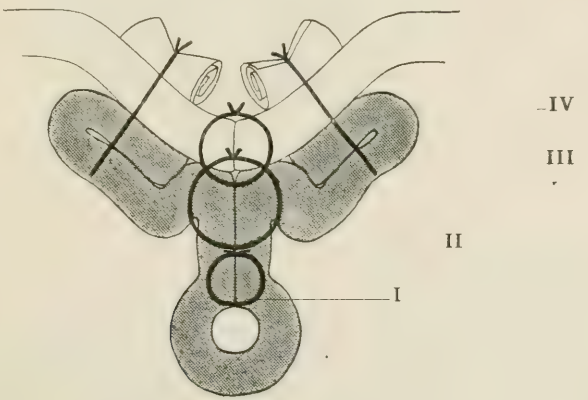


Sectional diagram showing method of obliterating the aneurismal sac in the *fusiform* type of aneurism with two openings. In this class of cases (Figs. 1, 2, and 3) the tunics of the parent artery blend with the sac, and the arterial channel cannot be restored.

The diagram shows the first row of sutures (I), which obliterates the orifice of the artery at the bottom of the sac. The second row of sutures is shown higher up (II), and also the effect of this row in reducing the capacity of the sac. The obliteration of the remaining part of the cavity by the folding in or inversion of the sac walls, with the attached overlying skin, is shown in III.

The function of the deep sutures (IV) tied over gauze pads, and of the more superficial skin sutures (V) in obtaining firm contact of the opposed surfaces, is also shown. This drawing is purely schematic; it gives an exaggerated idea of the size of the sac walls, and is chiefly intended to give an idea of the position of the sutures and other parts.

FIG. 14.



A diagram showing sectional view of the obliterated aneurismal sac when the lumen of the parent artery is preserved and the vessel originally communicates with the aneurism by a single orifice.

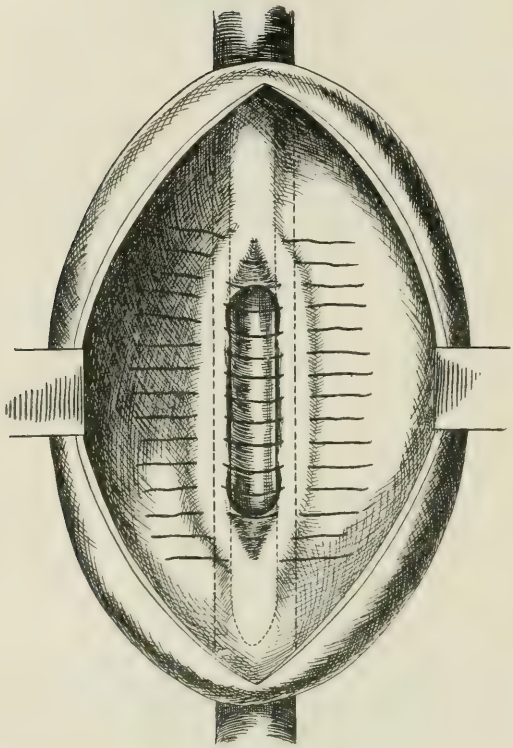
I. First line of sutures which close the orifice of communication and restore the lumen of the parent vessel.

II. Second row of protecting sutures which also reduce the size of the sac.

III. Supporting through-and-through sutures, which bring the roof and floor of the aneurism in contact.

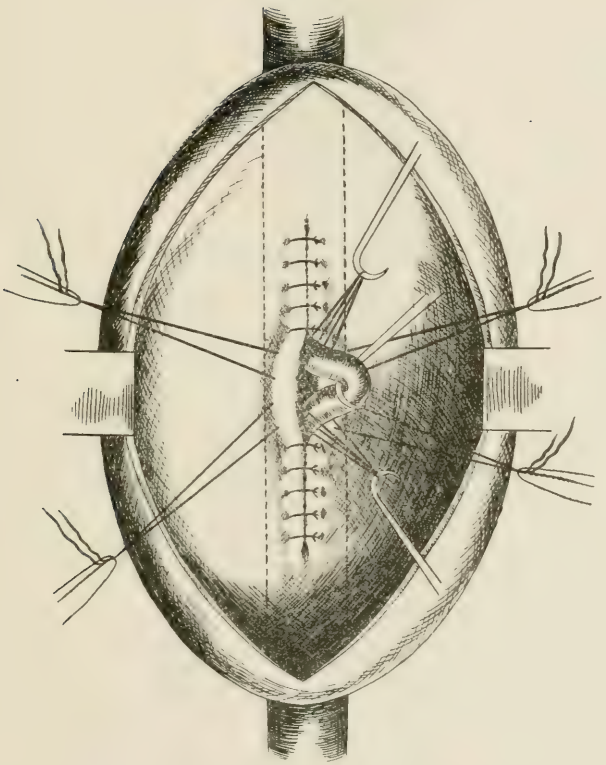
IV. Sutures which hold the skin flap and sac in contact with the bottom of the cavity. This diagram will also show the result of the procedure illustrated in Figs. 15 and 16.

FIG. 15.



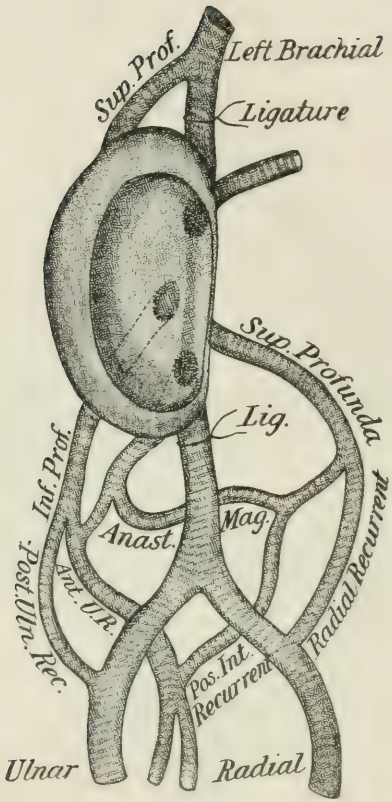
Shows a possible but not yet tried method of restoring the large lumen of the parent artery in favorable cases of fusiform aneurism with two openings in which the healthy and flexible character of the sac will permit of the restoration of the arterial channel by lifting two lateral folds of the sac and bringing them together by suture over a soft rubber guide. The principle of this operation is precisely like that adopted in a Witzel gastrostomy. The figure shows the soft rubber catheter lying on the floor of the sac and inserted in the two orifices of communication. The sutures are placed while the catheter is in position acting as a guide.

FIG. 16.



This shows a more advanced step of the procedure described in Fig. 15. The sutures are nearly all tied, and the new channel is completed except in the centre. The two middle sutures are hooked and pulled out of the way while still in position, and the catheter is withdrawn. The obliteration of the sac and final steps of the operation are carried out precisely as previously described in Figs. 4, 5, 6, and 7.

FIG. 17.



This is a reproduction of a diagram published in the *Medical News* (Phila.), October 27, 1888. It is intended to explain the condition found in a case of traumatic aneurism in which the author applied intrasaccular arteriorrhaphy for the first time. The abundance of the collateral supply in that case could only be accounted for by a distribution of the vessels such as shown in this figure.

The failure of the ligatures applied to the main artery above and below the sac and difficulties of extirpation were well illustrated in this case, and led to the suture of the aneur smal orifices, which promptly secured their obliteration and an immediate arrest of the hemorrhage.

to irritation. The reaction of the intima to irritants is very much less than that of the peritoneum, and much more than that of the dura, being about midway between the two (Murphy). It follows, therefore, from what has been stated, that the aneurismal sac, with its fibrous basal membrane and endothelial intima (more or less modified by morbid agencies), can be properly regarded from the surgical viewpoint as a serous sac closely analogous to the peritoneal serosa, and, as such, capable of yielding the same plastic results which have been so helpful to the surgeon in his interventions in the abdominal cavity.

This concept of the sac is the basis of the method here described and successfully utilized by the author in securing the obliteration of the aneurismal pouch and its orifices by suture.

The application of the suture within the sac in the manner to be described is simply an application on a larger scale of the knowledge already obtained in other fields of arterial surgery. It is simply an adaptation of the principles of arterial repair and regeneration which underlie the daily application of the modern aseptic ligature, the suture of veins and the more recently introduced but fully recognized technique of circular and linear arteriorrhaphy. The only difference between these procedures and the one now under consideration is that in the later the arterial tunics are attacked directly from within the lumen of the arteries, or rather, inside of their expansion in the aneursmal sac; and that the sensitive intima is utilized throughout by the infolding of its surfaces, and given the best opportunity to display its plastic qualities. This is the more apparent when we consider that the aneurismal sac is not detached in this procedure from any of its surroundings, and in this way its vascular supply and its vitality are not in the least impaired.

After this preliminary statement of the general histological and anatomical data upon which the operation is based we are prepared to consider the method itself as applied in the most typical cases.

III.

Steps of the Operation as Applied to Peripheral Aneurisms of the Larger Arteries.

1. *Prophylactic hæmostasis.* The circulation of the limb should be controlled by preliminary elevation of the limb, followed by the application of the Esmarch elastic constrictor. Prophylactic hæmostasis may also be obtained when the aneurism is situated high up near the root of a limb (or in the neck) by exposing the main artery near the cardiac pole of the tumor and compressing it with a traction loop passed under the artery and held by an assistant. Pressure may also be applied over the exposed artery by the finger of an assistant after duly protecting the vessel with a pad of sterile gauze. The artery may be still better controlled by direct pressure with padded forceps: Billroth's forceps, with broad blades and graduated catch, the blades covered with rubber (Murphy, Burci); with a special clamp for this purpose (Crile's, Allegiani's, J. Tilden Brown); by ordinary spring clamps, such as Langenbeck's Serre-Plat's (Tomaselli), etc. I have found the simple silk traction loop to be the most convenient, because it is always at hand; but I believe that a properly-made clamp, permitting a careful adjustment of pressure, such as the Crile[1] or Allegiani[2] compressors, would be preferable. In carotid and other cervical aneurisms the collateral circulation is so free on the distal side that both poles of the tumor should be controlled, if possible, before opening it.

2. *Incision of the skin and exposure of the sac.* After all perceptible pulsation in the tumor has been arrested by the measures previously described, a free incision, parallel with the long axis of the aneurism, should be made down to the sac, exposing it to view from one end to the other. When the

[1] See Problems Relating to Surgical Operations. A New Method of Controlling Hemorrhage in Certain Operations on the Head and Neck. By George W. Crile. J. B. Lippincott Co., 1901.

[2] See Umberto Allegiani, Il Policlinico, Roma, Anno 8, May 10, 1902.

tumor is deeply seated under the skin the sac should be exposed by careful dissection for some distance on each side of the cutaneous incision in order to identify any important structures (nerves, arteries, and veins) that might be adherent to its superficial surface. In any event this dissection should not be carried beyond the more prominent or superficial portion of the sac. If any important nerves or other structures should be found attached to the sac and in the way of a free longitudinal incision, these should be carefully detached and held out of the way with retractors.

3. *Opening of the sac and evacuation of its contents; recognition of the type of sac, number of openings, etc.* A free incision is now made into the sac, extending from one extremity of the tumor to the other in its longest diameter and in the line of the main artery. The contained blood and clots are evacuated and the interior of the cavity is freely exposed to view by vigorous retraction of its edges. This will expose all the orifices which open into the sac. The type of sac that is being dealt with will now be disclosed. If it is a *fusiform* aneurism, two large openings will be seen, usually at the bottom of the sac, separated by an intervening space of variable length, frequently marked by a shallow groove which represents the continuation of the floor of the parent artery. This is more often seen in the aneurisms of the extremities than elsewhere. If the aneurism is of the *sacciform* type, there will be a single opening of variable size, circular or ovoidal in shape, which connects the sac with the main artery. The differentiation of the sac into the two fundamental varieties just described is most important in its bearings upon the further aims of the technique. In the spontaneous aneurisms of the *fusiform* type the artery blends so completely with the sac walls that its continuity cannot be restored, at least in the present state of our experience. In these cases the object of the suture is simply to seal the openings leading to the artery for the purpose of hæmostasis and obliteration of the sac. In the *sacciform* aneurisms, with a single opening leading to the main vessel, it is often quite possible to close the opening without encroaching upon the lumen

of the parent vessel, thus maintaining the functional as well as anatomical continuity of the artery.

We shall now consider separately the treatment of the first variety—the *fusiform* aneurisms with two main openings.

At this juncture, while the interior of the cavity is exposed and after the chief openings have been identified, careful search should be made in the floor of the sac (especially in the fusiform aneurisms) to discover the openings of any collaterals or branches springing from the sac, which, if not carefully sutured, would give rise to troublesome hemorrhage. (See Observations 1, 3, and 4.) If there is any bleeding from any of the orifices as a result of a free collateral supply, the closure of these openings by suture should be at once proceded with. This kind of bleeding can only occur during the operation in cases in which the circulation of the sac is controlled solely by pressure on the cardiac side of the main artery with a traction loop or other contrivance, and not by general circular constriction at the root of the limb. Whenever the tourniquet or constrictor can be used the ischæmia is complete. The mechanism by which these bleedings are produced in spite of the most perfect control of the artery on the cardiac side is plainly shown in Figs. 1, 2, and 3, and especially in Fig. 17, which is intended to explain the unusual condition encountered in Observation 1. In this case, as well as in Observation 4, the most important bleeding appeared to come from the collaterals which emptied into the main artery between the point of compression and the orifices within the sac. Fortunately, this bleeding is readily controlled by pressure, which should be applied directly over the bleeding openings with the finger or sterile sponges until they are sealed by rapid, continued suture. When the hæmostasis is complete the interior of the sac should be gently, but thoroughly, scrubbed with gauze soaked in sterile saline solution, with the view to clearing it of adherent laminated blood clots, which interfere with the healing of the sutured surfaces. This toilet of the sac also improves the circulation of the intima and prepares it for prompt plastic reaction when the surfaces of the sac are brought in apposition. In this respect the serous lining of the aneurismal

sac, which is simply an extension of the intima of the parent artery, closely resembles the peritoneal serosa, and this, as is well known, unites more quickly when sutured after a preliminary irritation by rubbing, scarification, or abrasion.

4. *Closure of the aneurismal orifices in the fusiform type of sac.* After the interior of the aneurism has been carefully prepared by this preliminary toilet the systematic closure of all the visible orifices opening into the sac by suture should be proceeded with, if this has not been done already, as in the conditions previously referred to. The tissues about the margin of these orifices are usually strong, firm, resisting, and hold the sutures well.

The orifices in the sac attached to the larger vessel are often large enough to admit the index finger of the operator, and the margins are so thick that comparatively few sutures will be required to bring them into apposition. The suture material may be either twisted, braided, or floss silk, chromicized catgut, or even the finest kind of kangaroo tendon; the size of the thread of whatever kind used should correspond with the size of the needle, and this in turn should vary in size according to the dimensions on the openings to be closed and the density of tissues to be sutured. I prefer absorbable sutures, and of these well-prepared chromicized catgut (Nos. 1, 2, and 3) is the best. This material is strong, and remains in the tissues long enough to accomplish its purpose. In applying the sutures the size and shape of the needle are important. The best needles are the round, full curved, with long eyes and prismatic points. Those designed for intestinal sutures are admirably adapted for the present purpose. The full curved needles, known as Mayo's, Kelly's, and Ferguson's, which are intended for intestinal work, are all excellent; but I have used the ordinary curved surgical needles, and even Hagerdorn needles, with satisfactory results. As a rule, the continued suture will do well in all cases, especially when time is pressing. When the object of the suture is solely to seal the opening for hæmostatic purposes, and not to restore the calibre of the vessel to which it is attached, as is the case in saccular aneu-

risms, then the continued suture will be found to be not only the most rapid but the most effective. The distance which should separate the suture points should be regulated by the size of the opening to be closed. Eight or ten sutures to the inch are more than sufficient. In suturing wounds of *normal* arteries very fine needles and silk should be used, and the sutures should enter the vessel one-sixteenth of one-twentieth of an inch apart. In closing the orifices of aneurismal sacs the conditions are, however, altogether different, as aneurismal tissues are so much thicker and more easily approximated. What is more important is to secure a firm grip of the sac tunics so as to bring a broad surface in confrontation. In dealing with the larger openings in this class of aneurisms (fusiform), the needle should penetrate at least one-quarter or one-sixth of an inch beyond the margin of the orifice, and then, after reappearing at the margin, dip again into the floor of the artery, and continue to the opposite margin as in the start (see Fig. 3). This mode of occluding the orifice of the main artery will secure a very complete apposition of a large marginal area, including the floor of the artery which is visible under the orifice. When the openings must be closed quickly, as in cases in which there is considerable bleeding from collateral vessels, the dip of the needle into the floor of the vessel may be omitted, and the margins of the orifices are brought together quickly with a continued suture. In suturing these orifices the operator should act precisely as in closing perforations of the bowel covered with peritoneum, and remember that the principle of the suture is here, intima to intima or serosa to serosa, as in applying the Lembert suture to a perforated bowel. The one capital point of difference in the analogy is that the membrane dealt with is practically all serosa and that it is continuous with the interior of the artery to be closed; there is no mucosa or infection to be dreaded. Hence the invariable tendency of the tissues to heal by primary union and aseptic plastic endarteritis when brought together in broad and firm apposition.

Continuing with the technique of suture as applied to the *fusiform* aneurisms with two openings, I have found it advan-

tageous to extend the first line of suture from one orifice to another when the intervening space is not too long. These sutures include the floor of the sac (see Fig. 4), and are applied on the Lembert plan. They fold up and bring together a considerable area of the floor of the sac, which is thus raised to the upper level of the orifices; in this way they diminish not only the transverse diameter of the sac, but lay the foundation for the obliteration of the cavity which is to follow. If the floor is dense, rigid, or bound down by adhesions to unyielding parts (which is not often the case) the suture should be limited to the orifices.

5. *The sacciform aneurisms with a single orifice of communication; hæmostatic and reconstructive suture with the view of preserving the lumen of the parent artery* (see Figs 8 and 9). This type of sac is the most favorable for the display of the conservative value of arteriorrhaphy from every point of view. The intrasaccular suture of the orifice not only permits of the radical cure of the aneurism by closing its nutrient orifice, but also favors the restoration of the affected artery to its functional and anatomical integrity. The suture is here not only occlusive but reconstructive. The same material and needles should be used as in the previous case, the main point to bear in mind is that in introducing the sutures these should be inserted at a sufficient distance from the usually thick and smooth margins of the opening in order to secure a firm and deep hold of the fibrous basal membrane (see Figs. 10, 11, and 12). The needle should be made to appear just within the lower edge of the margin, care being taken that when the sutures are tightened the calibre of the artery will not be encroached upon too much and that the threads will not be brought in contact with the blood in the lumen of the artery. Greater care must be exercised in securing accurate coaptation in this class of cases than in the fusiform type previously described. As shown in Figs. 10 and 11, it will be advantageous to begin the line of suture at some distance from the orifice, as this will secure a broader and stronger line of approximation. The larger the calibre of the parent vessel the more favorable will the conditions be for the

restoration of the lumen of the artery and for the functional success of the operation.

6. *Removal of constrictor and test of sutures.* After all visible orifices in the sac have been closed by suture, the constrictor or other provisional means adopted to control the circulation are removed. The interior of the cavity should now be perfectly dry, and the only change noticed by a return of the circulation should be an improved, more pinkish color of the sac. If there be any oozing capillary points these will be usually stopped by pressure and by the means subsequently adopted to obliterate the cavity.

7. *Obliteration of the aneurismal sac* (see Figs. 4, 5, and 6). This step of the operation is the same in all cases. In large sacs, where the floor of the cavity is deeply situated and there is an abundance or even redundance of material, it will be a good practice, as previously stated, to reinforce the first line of occlusive sutures by a second row, applied also on the Lembert plan at a higher level. This second row will raise up and bring together a considerable surface of the sac floor and lateral walls of the cavity, and when finished will not only bury the first plane of sutures, but will reduce the dimensions of the sac considerably (see Fig. 4). The closure of the aneurismal space is now readily accomplished by turning the relaxed flaps of skin into the interior of the cavity. If the sac has not been previously dissected from its surroundings, the skin flaps will be lined on their inner surface with the smooth sac walls, thus constituting an aneurismo-cutaneous flap on each side. These flaps, in their relaxed state, can, as a rule, be made to touch the bottom of the cavity with comparative ease. One or two relaxation sutures on each side of the median line will usually suffice to tack down and hold the skin flaps in contact with the bottom and sides of the sac. The sutures are best applied with a large size, full-curved intestinal needle, which is made to grasp a considerable portion of the needle in its bight. The needle should penetrate through the entire thickness of the sac; by carrying it through in this way a loop is formed, the two ends of which are carried through the skin flaps by transfixion with

a straight Reverdin needle, and tied firmly over a loose pad of gauze after the flaps have been carefully adjusted in position (see Figs. 5 and 6).

The principle adopted in the obliteration of the sac has been made familiar by Neuber's method of closing bone cavities with cutaneo-periosteal flaps. After the relaxation sutures have been tied the edges of the skin should come in close contact in the median line, and all that will be required to finish the operation will be a few interrupted catgut sutures to complete the approximation of the skin margins (see Fig. 7). When the operation is completed the aneurismal cavity is obliterated without in the least disturbing the sac or interfering with its vascular relations. The collateral circulation, which is usually important in the vicinity of the aneurism, is also respected, and in this way the best condition for the maintenance of a healthy nutrition in the sac and in the parts beyond the aneurism are assured.

At the sight of the bulging tumor which previously existed there will be a depression varying in depth according to the size of the original sac, and presenting the appearance of an inverted hollow cone or ovoid. As no exposed or raw surfaces are left in view, there is no need for drainage, and union per primam can be confidently expected, thus greatly abbreviating the duration of the after-treatment.

Dressings. A simple sterile gauze dressing is applied as a graduated compress to fill the hollow left at the sight of the aneurism. This is held in place by a few strips of aseptic rubber plaster. The limb is then wrapped up from the periphery to the trunk in a thick layer of cotton-batting, over which a well-padded splint is adjusted to secure the immobility of the entire limb, especially if the field of the operation occupies one of the flexures of the limb. If sufficient padding has been applied to protect the distal parts from undue pressure or exposure to cold, a starch bandage or a light plaster-of-Paris roller over the whole limb will complete the dressing. If there are no reasons to the contrary, the first dressing should not be disturbed for a period of a week or ten days.

IV.

Additional Remarks on the Obliteration of the Sac in Certain Atypical and Exceptional Conditions.

It is possible that in certain cases the obliteration of the cavity by inverting the walls of the sac with the overlying skin will not be practicable. This is more likely to be the case in the iliac and other abdominal aneurisms in which the sac is covered by peritoneum. In such a contingency the same object will be obtained by inverting the sac walls with the overlying peritoneum which covers the aneurism. The peritoneum is not to be separated by dissection, but is allowed to remain adherent to the sac, and is utilized in place of the skin flap with even greater ease and certainty of successful union than when the skin is used. The procedure is therefore precisely the same as that adopted in the typical surface cases, with the only exception that the peritoneum is used instead of the skin. Again, when operating upon deep-seated aneurisms of the extremities or neck, it may happen that in stout, well-nourished or muscular subjects, especially when the femoral or popliteal regions are involved, that the skin flaps will not stretch enough to reach the bottom of a deeply placed cavity without excessive tension. In such cases, rather than imperil the vitality of the skin by overstretching, it will be the safer plan to obliterate the sac itself with its own walls independently of the skin. The technique will then be the same as that described for the typical surface cases as far as the obliteration of the orifices is concerned, and the introduction of the second or protective row of stitches, as shown in Fig. 4; after this the excess of sac wall that remains above the second line of stitches is excised as superfluous, and the edges of the sac are approximated by interrupted or continued catgut sutures. In this way the inner surface of the sac, including the orifices, floor, and part of the lateral walls are thoroughly approximated, and the sac is obliterated, but remains buried in the floor of the incision. It is easy then to close up the wound by bring-

ing together all the soft parts by separate rows of buried sutures, including the skin incision, which is closed without drainage. It is most important to remember in all this work that the sac is dependent for its nutrition upon the vessels furnished largely by the perianeurismal tissues, and that any extensive dissection of the sac from its bed is likely to interfere with the reactionary processes so necessary for its obliteration. Therefore, it will be safer to excise those parts of the sac which have been detached by dissection from their vascular surroundings. One of the dangers of the old Antyllian operation was the tendency to suppuration and sloughing, which followed through a disregard of this precaution ; the sac was often entirely lifted out of its bed, and allowed to remain in the wound after the vessels which communicated with it had been ligated. In this way it remained a foreign and dead body which taxed all the resources of nature to eliminate, and was the cause of endless trouble and even fatal disasters from infection and secondary hemorrhage. No wonder, then, that after the advent of the aseptic period the surgeon should have discarded the old operation and turned with favor toward the radical operation with extirpation of the sac.

V.

Suggestions in Regard to the Technique of the Operation in Dealing with Fusiform Aneurisms with Two Orifices.

It will be noticed that in describing the various steps of the operation we have constantly kept in mind the two fundamental types of aneurisms, the fusiform and the sacciform. The fusiform, in which the main artery communicates by two openings with the sac, is more often of pathological origin, the sacciform of traumatic causation. Both of these types, however, may be seen when aneurisms follow a direct injury of the artery, and when this is the case in the fusiform aneurisms the coats of the sac are not so diseased or degenerate as to prohibit a further conservative effort to restore the lost lumen of the parent artery.

In these fusiform sacs the practice of the author thus far has been to limit the intervention to the obliteration of the orifices where they blend with the sac and to obliterate it in the manner previously described. While writing this paper the thought has suggested itself that it would not be impracticable or unreasonable when favorable conditions presented themselves, as is apt to be in the larger aneurisms, which offer an abundance of material and a flexible floor, to go a step further and to re-establish the lost arterial channel by the procedure shown in Figs. 15 and 16, and in sectional diagram 14. The principle of this operation is precisely that adopted in Witzel's method of gastrostomy. As shown in Fig. 15, a soft-rubber catheter or tube, corresponding in diameter to the size of the parent artery, is laid on the floor of the sac, and is inserted as a guide in the two orifices of communication. Two lateral folds of the sac are now raised from the floor on each side of the catheter by means of two sets of sutures introduced on the Lembert plan. These ridges or folds should be raised high enough on each side of the guide to cover it completely in the middle line. A row of sutures should now be placed in a series from one of the main orifices to the other, leaving the catheter *in situ* until all are placed. The subsequent step of the procedure are shown in Fig. 16. The sutures are all tied except those in the centre of the line of union, which are not tied until the guide has been removed. When possible a second superimposed continued line of sutures should be applied over the first step, as is shown in Fig. 4, illustrating the typical procedure. In this way a continuous channel is established which connects the main orifices of communication and permits the blood to flow directly and uninterruptedly through the tract of the parent vessel to the distal parts. While it is evident that this suggestion is only applicable to certain favorable cases, its practicability and the great object to be gained by its accomplishment should not be overlooked, more especially in the great aneurisms at the root of limbs and in the abdomen, where the conditions justifying its performance frequently exist.

VI.

My experience with this method of endoarteriorrhaphy, or, rather, to define it more accurately, endoaneurismorrhaphy, if I may be permitted such a neologism, is limited to four cases: two of direct traumatic aneurism of the brachial, caused by gunshot wounds, one of which involved the lower and the other the upper third of this artery; one femoral and one popliteal, and both of the so-called spontaneous variety. The first operation dates as far back as March, 1888, and was published in the *Medical News* in the issue of October 27, 1888. This case presented features of exceptional interest apart from the method of treatment employed. It is one of the cases of traumatic aneurism of the brachial caused by gunshot wound, and is fully reported in Observation 1. In this case (a very large sac) indirect and direct compression by Reid's method were tried unsuccessfully; then ligatures were applied above and below the sac at different sittings, and failed; the pulsation returned on the tenth day. Upon opening the aneurism its rebelliousness was explained by finding the openings of several large collaterals which kept up the circulation in the tumor after the main artery had been ligated above and below the sac. The anastomotic circulation which accounted for this unusual condition is explained by Fig. 17, which is reproduced from the original article. In this case (a large aneurism of the fusiform type) extirpation was attempted, but had to be abandoned because of the great risk of injuring adherent nerves which were incorporated in its walls. Under these circumstances, and without any previous knowledge of the practicability of suture in such cases, all the bleeding was immediately controlled by suturing the orifices with fine silk. A redundant portion of the sac which had been detached by dissection was excised, leaving the floor and lateral walls undisturbed, to heal by granulation. A long interval elapsed between this and the next case (Observation 2), which was operated by more advanced technique in the summer of 1900; several opportunities had presented themselves in the inter-

val for the application of this method, but I had not yet overcome the dread of atheroma and secondary hemorrhage. But the disastrous results which followed in a case of femoral aneurism treated by Hunterian ligation, in which the patient barely escaped with his life after an amputation at the thigh for gangrene, and also the vivid recollections of the great difficulties encountered in extirpating a femoral aneurism of Scarpa's triangle, followed also by gangrene of the toes, led me to revert to the method of incision and suture detailed in Observation 2. After this experience I grew more confident, and applied the operation with more boldness, and added the modifications referred to in describing the technique of obliteration (see Observations 3 and 4).

While this experience is too limited to justify any dogmatic or broad generalizations, the simplicity of the method and the favorable results thus far obtained are sufficient to encourage its more general application. The later suggestions and modifications made in this paper, which aim at the further conservation of the main trunk, and thus safeguarding the integrity of the circulation in the sacciform and fusiform aneurisms, are still waiting the test of clinical experience. But from *a priori* grounds and the experience thus far gained, it would appear quite reasonable to anticipate still greater gains in a conservative direction in a group of cases in which the classical procedure is still fraught with great uncertainty.

As the chief object of this paper has been to describe the technique of this procedure and to relate the author's personal experience in its practical application, no systematic effort will be made to study its comparative merits in relation to other methods of treating aneurisms. The indications for the application of this operation have been sufficiently stated. It is intended to meet the conditions which call for the radical operation by extirpation. It is not intended to supplant it altogether, because extirpation is still the method of election in dealing with the smaller aneurisms of the secondary arteries of the extremities, in which the question of mortification or gangrene does not enter into consideration on account of the certainty of

an abundant vascular supply. Its chief object is to simplify the technique of the radical cure, to make it less bloody, to diminish the traumatism, to interfere less with the important neighboring structures, which are often damaged by extirpation (veins, nerves, and organs), and, above all, to reduce the dangers of gangrene of the distal parts to the strictest minimum compatible with the cure of the aneurism.

It is only just to state that after a careful inquiry into the literature of aneurism I have failed to find any reference to a procedure that resembled or suggested the method described in this paper. In the constantly-growing list of contributions on the subject of arterial suture there are frequent allusions and suggestions as to the possible advantages of suture in the treatment of traumatic and arterio-venous aneurisms. These recommendations all refer to the direct suture of the artery in recent wounds or at the bottom of diffuse extravasations and pulsating hæmatomas in which no well-circumscribed sac exists. The three reported cases of arterio-venous aneurism in which the arteries had been detached from the veins and sutured by lateral and circular arteriorrhaphy have been mentioned at the beginning of this paper. These cases, however, represent conditions which are entirely different from those under consideration. A single exception that I have found in the literature of the subject is the notable contribution by J. B. Murphy, of Chicago, on the resection of arteries and veins injured in continuity (*Medical Record*, New York, January 16, 1897), in which he boldly and very originally discusses the practicability of attacking fusiform aneurisms by *extirpation* of the sac and suture of the arterial orifices. He divides the indication for arteriorrhaphy into four groups: (1) Injuries to large vessels in operations; (2) injuries of large vessels from stab, puncture, bullet, or lacerating wounds; (3) traumatic and dissecting aneurisms; (4) sacculated, fusiform, and arterio-venous aneurisms. His remarks on groups 3 and 4 are so apposite to the present subject that they justify full quotation, as they bear the stamp of authority vested by an unusually large experimental and clinical experience in arterial surgery. He says: "In traumatic aneu-

risms of long standing we have the best variety of cases for arterial suture. The opening in the artery is usually small, the arterial wall is healthy, and a sufficient quantity of aneurismal stump may be retained to produce a firm line of approximation. From a theoretical standpoint, as well as from the results of experiments, there is no danger of the formation of aneurism at the point of primary suture for injuries, and should not be for secondary sutures, as in aneurisms of this class. The vessel should be exposed above and below the aneurism, and temporary hæmostasis obtained by a very mild compression forceps. The aneurismal sac should then be freely opened and dissected down to the position of the opening in the artery. The edges of the artery should be freshened and closed, the same technique being observed as in primary suture. In the fourth class of cases—*i. e.*, sacculated, fusiform, and arteriovenous aneurisms—the aneurismal sac should be exposed and dissected down to the healthy coats of the artery, where it should be amputated, leaving sufficient of the aneurismal coat and arterial wall to allow a row of sutures involving one-sixteenth of an inch of the margin on either side, so that when the suture is complete the size of the vessel will be below its normal calibre. This lessens the arterial pressure of the vessel at that point, and there should follow a union of the wall," etc.

This, I believe, is the first specific statement that has been published describing a general method of dealing with aneurisms by suture, though I had used the method of suture in the obliteration of the orifices of an aneurism, and published a full account of the case nearly ten years before the publication of Dr. Murphy's experimental contribution.

It will be seen, however, by the quotations above given that Dr. Murphy's procedure, bold and brilliant as it is in its conception, is entirely different from that described in this article. Murphy's suggested operation is practically an extirpation of the sac, and as such is fraught with all the difficulties and undesirable features of this operation, with the added difficulty of suturing the openings in the vessel itself. He has also overlooked the fact that in fusiform aneurisms the continuity of the

main artery is lost for a considerable distance in the sac, where it merges completely with the aneurismal walls; hence the impracticability of resecting the sac by the method he suggests. In the sacciform and the arterio-venous aneurism his procedure is perfectly feasible, but the same result can be accomplished by the much easier and safer plan described in this contribution.

VII.

In conclusion the writer would submit the following propositions:

1. That the recognized advantages of the radical operation for the cure of aneurisms of the peripheral arteries, as demonstrated by the statistics of the last decade, can be greatly increased and the sphere of application of this operation can be broadened by the adoption of the method of suture and obliteration of the sac instead of the classical ligation of the arteries, with or without extirpation, as hitherto practised.

2. That the closure of the arterial orifices which supply the aneurismal sac, whether these be single or multiple, by means of suture, and within the aneurismal sac itself, greatly simplifies the technique of the radical operation, and is a reliable means of securing hæmostasis.

3. That in favorable cases and the saccular aneurisms with a single orifice communicating with the lumen of the larger arterial trunks are the most favorable—it is possible, by careful suture, to obliterate the aneurismal opening without obstructing the lumen of the parent artery, thus protecting the limb from the risk of gangrene.

4. It is also possible in favorable cases of fusiform aneurisms of traumatic origin, and in all those in which the sac material is healthy and pliable, to restore the lost continuity of the artery by building a new channel which will connect the two main orifices of communication and restore the interrupted circulation in the parent vessel. This result can be obtained by utilizing the sac in the manner previously described by the author.

5. That the fear that atheroma and other degenerative changes will interfere with the healing and repair of the arterial tunics has been greatly exaggerated is shown by the abundant experience of the aseptic period in the ligature of sclerotic arteries in continuity, in the absence of secondary hemorrhage in the amputated stumps of the aged, diabetic, and other arterially diseased subjects (Heidenhain, Webber, Barwell and others), and is still demonstrated more fully by the observations and statistics of the partisans of the radical operation by extirpation (Delbet, Kubler, Ransohoff, Annandale, and others) who have reported numerous successful results in spontaneous as well as in traumatic aneurisms.

6. The fallacy and dangers of the old operation of Antyllus lie (*a*) in the fact that the preliminary ligation of the main artery above and below the sac will not always control the bleeding from the collaterals which often open into the aneurism or into the main trunks between the orifices in the sac and at the seat of ligature. This compels a more or less extensive dissection of the sac out of its bed as one of the necessary features of the procedure, in order to secure all the collateral vessels that empty into the sac, unless the uncertain process of plugging the openings and packing the sac itself is resorted to. If the sac is dissected, as is usually done to secure the collaterals, the difficulties of the operation are increased, and the vitality of the limb is endangered by interfering with the collateral circulation which, in many types of aneurism, is most freely developed in the neighborhood of the sac.

(*b*) Another serious objection to the old Antyllian operation as usually performed is that the sac is allowed to remain as an open cavity in the bottom of the wound, where it is packed or drained and allowed to heal by granulation. This invites infection, suppuration, and its attendant dangers of secondary hemorrhage; all that is obviated by the method of endo-aneurismorrhaphy, which does not disturb the sac from its vascular connection, and favors its prompt obliteration by suturing the infolded walls of the sac, and keeping them in direct and close approximation.

7. The uncertainties and dangers of extirpation of the sac (Purmann's operation) are even more apparent than those of the Antyllus operation, because, in addition to the greater technical difficulties of extirpation, there is much greater risk of injury to the accompanying satellite veins and nerves which blend most intimately with the sac, and often compel the operator to limit his intervention to a partial extirpation, leaving behind a considerable portion of the sac wall in order to avoid injury to important adherent structures. The greatest objection to extirpation, however, lies in the decided interference with the collateral circulation in the immediate vicinity of the aneurism, which entails a considerable risk of mortification in the distal parts. All these dangers are reduced to a safe minimum, and are largely eliminated by simply obliterating the sac, instead of extirpating it.

VIII.

Synopsis of Clinical Reports of Cases of Aneurism Treated by Suture of the Orifices in the Aneurismal Sac According to the Author's Method.

Observation 1. *Traumatic aneurism of the left brachial artery; recovery.*—(Abstract of report published in the *Medical News*, Philadelphia, October 27, 1888.) W. H., colored, laborer, aged twenty-six years, was admitted to the Charity Hospital, New Orleans, Ward No. 2, March 30, 1888. Two months before admission he was accidentally shot with a rifle; the whole load, consisting of fine bird shot, was distributed over the scapular, posterior acromial, and humeral regions, the gun having been fired at a distance of fifteen feet from the patient. Two weeks after the injury he noticed a swelling on the inner and posterior aspect of the arm, nearly midway between the bend of the elbow and the lower border of the armpit. The tumor extended, when the patient was admitted to the hospital, from a point three inches below the lower border of the pectoralis major and terminated at a point one and a half inches from the bend of the elbow. All the characteristic signs of aneurism were present. Treatment was begun by trying elastic compression (Reid's method), then instrumental compression with the Massachusetts Hospital compressor, which was applied on the brachial artery on the cardiac side of the

aneurism, but these methods failed to produce any permanent impression on the tumor. On April 23d the brachial artery was ligated just below the superior profunda immediately above the tumor (Anel's ligation) with Kocher's juniper catgut No. 9; union per primam. This was followed by a total arrest of pulsation and by a marked reduction in the size of the tumor. On the tenth day pulsation returned, and with it all the aneurismal signs. On the fourth day after the reappearance of the aneurismal signs the artery was again ligated on the distal side, just below the lower pole of the tumor. Notwithstanding this second ligation, the aneurism continued to pulsate, and remained as active as ever. Therefore, at the same sitting, the Esmarch constrictor was applied, and, after complete ischæmia had been obtained the sac was freely exposed by a longitudinal incision extending from one extremity of the tumor to the other. The incision was six and a half inches long, and was undertaken with the intention of completely extirpating the sac. After isolating both ends of the sac and large portion of its anterior and internal aspect, it was found impossible to extirpate the sac because of its intimate and dense adhesions to all the surrounding structures, including the median and ulnar nerves, the satellite veins, with the biceps and brachialis anticus muscles, etc., which had been incorporated in the walls of the aneurism. Further attempts at extirpation were now abandoned, and a large incision was made into the sac, extending from one extremity of the tumor to the other. A large mass of clot, some of it laminated, was now turned out, and an elliptical piece of the sac, representing its exposed anterior portion, was excised with scissors. After irrigating the cavity with weak sublimate solution, three large orifices were recognized in the bottom of the sac. Two of these orifices, corresponding to the proximal and distal openings of the main artery (brachial), were large enough to admit readily a No. 8 gum catheter. The third orifice, situated to the right of the median line, was just a little too small to allow this size of catheter to enter it. The gum catheter was now passed into the orifice nearest the axilla, and was felt passing upward inside of the artery until its progress was arrested at a point where the first (proximal) ligature had been tied fifteen days previously, proving clearly that the first catgut ligature had been effective in obliterating the artery at this point. Nevertheless, another catgut ligature was now applied while the catheter was *in situ*, the catheter being withdrawn as the knot was being tied. The catheter was now introduced

into the lower orifice of the aneurism, and was felt as it extended to the bend of the elbow, where it was arrested by the ligature which had been applied at the beginning of the operation. The only opening which now remained patulous was the third or middle orifice, which was smaller and had no apparent connection with the two preceding openings, and which, I supposed, represented the orifice of a large collateral springing from the walls of the injured artery; judging from its situation I took it to be the inferior profunda. There were only four ways that I could think of by which this large collateral vessel could be controlled: 1. By dissecting the sac from its surroundings until the vessel supplying this orifice could be reached as it entered the sac. 2. By passing a catheter or probe into the orifice from within the sac, and then making two small incisions or punctures on the side of the guide, which would permit an aneurismal needle or a threaded curved needle to carry a ligature around the vessel, including the sac wall (Annandale's suggestion). 3. To plug the orifice from within with an aseptic sponge or gauze pack. 4. *To suture* the orifice so as to seal it permanently. In view of the thickness of the sac, especially on the posterior walls, and its apparent soundness about the arterial orifice, I decided to try the last method because it appeared to me the more certain and expeditious, though at that time I had no experience with arteriorrhaphy. Should the sutures fail to hold, I felt that I could resort to either of the other three methods previously referred to. With a curved surgical needle threaded with fine silk four interrupted sutures were passed through the margins of the orifice so as to bring the intima in broad apposition; the sutures held perfectly well, and closed the orifice perfectly. Feeling secure now against hemorrhage from this source, the constrictor was released, but I was considerably surprised to notice a decided stream of blood pouring from the two other orifices, corresponding to the inlet and outlet of the main artery, which had been ligated above and below the sac. This was surprising in view of the fact that the ligature of the main artery had been made as close to the upper and lower poles of the aneurism as possible. It was evident from the outpour of the blood through both orifices that the sac was being fed by some important collaterals which communicated with the main artery at some point between the aneurismal orifices and the ligatures on the main trunk. In view of the complete obliteration of the third orifice which had been sutured, and the total absence from bleeding from this point,

I at once resolved to suture the main orifices while the tourniquet was being readjusted. The lips of each one of the openings were quickly sealed with continued sutures of fine sublimated silk passed through the thickness of the sac walls, thus securing a strong grip of the thick and resisting arterial coats which lined the orifices. The orifices were in this way quickly sealed, and when the tourniquet was relaxed not a single drop of blood escaped from them, and the hæmostasis was complete. The large sac that remained was now drained with a loose pack of sublimate gauze, and the skin incision with the remaining portion of the sac were closed with deep interrupted silk and catgut sutures, leaving a space only for the drain. The wound and sac cavity healed part per primam and partly by granulation and suppuration. The patient was discharged entirely well on May 21, 1888, with only a linear cicatrix to indicate the site of the aneurism.

Commentaries. This is the first case in the author's practice in which the bleeding orifices of an aneurismal sac were controlled by suture, and marks the first step in the evolution of his present method. It is well to note that in this case the aneurism was of distinctly traumatic origin, in a healthy subject, totally free from atheroma or endarteritis; and that the aneurism was of the fusiform type. It must be recognized that the anatomical conditions in this case were very unusual on account of the great abundance of the collateral supply, which accounts for the total failure of the ligatures applied to the main artery immediately above and below the tumor. A diagram showing the distribution of the collateral arteries is given in Fig. 17, and is particularly instructive in demonstrating the superiority of arteriorrhaphy in such cases. It is evident that with so large a tumor to deal with, and in view of the important nerves densely amalgamated with the sac, the classical method of extirpation would have involved not only a very severe traumatism, but would have imperilled the usefulness of the extremity from an almost unavoidable injury to the nerves. The simplicity of suture in securing hæmostasis, and its superiority over simple packing and other methods referred to from the points of view of security are so evident that these advantages need not further be discussed.

Observation 2. *Traumatic aneurism of right brachial artery, involving the upper third of the vessel; recovery.*—F. C., white, butcher, native of France, aged thirty-two years, while hunting with a friend in St. Tammany Parish in April, 1900, was accidentally shot

with a Colt's revolver, calibre 42, at close range. The bullet entered the antero-internal aspect of the arm, penetrating the biceps in the upper third of the arm, grazing the humerus, and escaping posteriorly near the shoulder-joint. Very little hemorrhage occurred at the time, and, in spite of careless treatment, the wound healed kindly. About five weeks after the injury a pulsating swelling was noticed on the inner side of the arm near the armpit. No serious attention was paid to the swelling until about three months after the accident, when, owing to the comparatively rapid growth of the tumor and the painful symptoms that accompanied it, the patient consulted me through the recommendation of his physician, the late Dr. D., of Algiers. I discovered a tumor four-and-one-half inches in length and ovoidal in shape. It had all the characteristic signs of aneurism. The upper part of the tumor just touched the lower border of the axilla (latissimus tendon). The patient was quite a stout man, and it was not easy to apply digital compression. I decided to ligate the brachial at its origin. This was done at the home of the patient, with the assistance of Dr. D. and other assistants. After incising the skin and exposing the upper pole of the tumor I found that the tumor encroached so much upon the axillary that I ligated this vessel above the subscapular with chromicized catgut (about one-and-a-half inches above the upper pole of the aneurism). All pulsation was immediately arrested, and the wound healed kindly per primam. About two months afterward the patient showed me his arm and the tumor, which had again "swelled up," as he said, and was now pulsating as vigorously as ever. Remembering my previous experience, I decided to incise the sac and suture the orifices, as I had done in the previous case. The patient was again operated upon at his home, as he had a great aversion for hospitals. An Esmarch bandage was applied from the fingers to a point about two inches below the lower (distal) limit of the tumor. The axillary was now controlled by the elastic tourniquet, and firmly held over the acromion by an assistant. A free incision was made over the tumor, and its upper pole was exposed, and a large chromicized catgut loop was applied to the brachial close to the sac, to secure provisional obliteration by traction; then the sac was incised longitudinally, and a large mass of mixed clot was evacuated. After thoroughly irrigating the cavity, the anterior wall of the sac was dissected out of its bed and an elliptical piece excised. Two large orifices, one the inlet and the other the outlet of the artery, were now

seen in the interior of the sac. The orifices were large enough to admit the tip of the little finger. Without further preliminaries the orifices were quickly sealed by a fine, continuous silk suture, which penetrated the entire thickness of the sac walls and brought together the intima in perfect apposition. The sutures held perfectly. The inner surface of the sac was smooth, and the walls particularly thick on the posterior surface, where they blended with the continuity of the artery. After suturing the orifices the elastic tourniquet was relaxed, and I was pleased to see that not a drop of blood escaped. The hæmostasis was complete. The skin and sac walls were now sutured together and to the bottom of the sac, leaving a middle space for drainage, and, after applying a copious antiseptic dressing, the arm was bandaged in the Desault position. Three weeks after the operation the wound had healed entirely, leaving only a small sinus, which healed up after the discharge of a silk suture. The patient has since moved his residence to Honduras, Central America, and was, according to recent reports of his friends, enjoying excellent health.

Commentaries. In this case we again note that we are dealing with direct traumatic aneurism in a young, healthy subject. Relapse occurred a short time after a ligature applied to the axillary (presumably above the subscapular). In a second operation the sac was incised, and the two orifices found in the sac were sutured and the hæmostasis was perfect. In this case the failure of the first operation—viz., ligation of the axillary—was evidently due to the great freedom of the collateral circulation through the subscapular or other branches which were given off from the brachial between the ligature and the orifices in the sac.

Observation 3. *Aneurism of the right popliteal artery; incision of the sac and suture of the arterial orifices by the author's method; regional anæsthesia by infiltration of the sciatic nerve with cocaine; recovery.* (Abstract of notes taken by Dr. L. J. Genella.)—A. P., white, aged twenty-seven years, married, saloon-keeper. Had been a heavy drinker for several years until six months before date of consultation. As a child had convulsions; gives a history of measles, clap, bubo, but denies having had syphilis. Family history negative. In February, 1900, he noticed a small lump on the "back of the knee" which pained him when he walked. In March he was admitted to the Charity Hospital (Ward 7), where the tumor was diagnosticated a popliteal aneurism. He was treated by

elastic compression and forced flexion. As the treatment gave him pain, he became impatient and deserted. He took potassium iodide for a considerable length of time at the suggestion of a physician, and continued to apply flexion with the help of an improvised apparatus which kept his knee bent; but this treatment he carried out intermittently and irregularly, as he was not tolerant of pain or much inconvenience. He gradually grew so much worse that he was again compelled to seek admission to the author's service, Ward 7, Charity Hospital, November 13, 1900, where he begged for an operation to relieve his sufferings.

On admission, a tense, elongated, fusiform swelling was readily recognized in the right popliteal space. The tumor roughly measured about six inches in length and three in breadth, entirely filling the popliteal space. No thrill and no marked diminution of the tumor on pressure, but there was a distinct expansile pulsation. A muffled murmur could be heard on auscultation. On November 15, 1900, the radical operation was attempted by regional anæsthesia, as the case appeared to be favorable for exposure and infiltration of the sciatic. Dr. Matas made a free incision under local infiltration anæsthesia (with one-fifth of one per cent. cocaine solution, Schleich), and the sciatic trunk was exposed and also infiltrated with the same solution. An Esmarch constrictor was now applied to the middle of the thigh. In a few minutes complete ischæmia and anæsthesia were obtained. The incision was now continued over the whole length of the tumor, six inches, and the sac, tense and bulging, was exposed. The popliteal and peroneal nerves were spread out, fan-like, over its surface, and great care had to be exercised to prevent their injury. At this stage the patient became very nervous and restless, complaining especially of the constrictor. A few drops of chloroform given with the Esmarch inhaler had the effect of immediately quieting the patient without abolishing consciousness, as he was able to reply to questions and had a clear knowledge of his surroundings. The chloroform simply eased the psychical pain and great mental tension under which the patient had been laboring. Dr. Matas then proceeded to the dissection of the sac, which was found to be densely adherent to all the surrounding tissues. The dissection was limited to the surface of the sac. The upper pole of the tumor was clearly exposed, overlapping the popliteal artery. A large tributary branch of the popliteal vein, probably the external saphenous, was found apparently obliterated by a

chronic endophlebitis. This trunk was ligated at two points and excised. The artery was also ligated immediately above the upper pole of the tumor with fine kangaroo tendon. The cutaneous incision was now extended downward over the calf so that it measured in all about eight inches, and the aneurismal sac was now laid open wide from one pole to the other. A large mass of grumous red clot (over one pint) was now scooped out of the cavity, which was thoroughly irrigated with hot saline solution, and the walls mopped out vigorously with wet sterile gauze. *A single large opening* admitting the index finger was exposed at the bottom of the sac leading to the popliteal artery, as this was traced with a probe. This opening was immediately sutured with a continuous silk suture involving the entire thickness of the sac walls at the margin of the orifice. A loose pack of gauze was left in the cavity, and the constrictor which was causing pain was removed. Arterial bleeding was now recognized coming from a diverticulum near the upper pole of the sac, which was fed by a large collateral. This was now exposed by incising the sac with scissors, and the opening leading to the bleeding vessel was controlled completely by continuous suture applied through and through the entire thickness of the sac in the margins of the orifice. The hæmostasis was now complete, and the color of the limb and foot was entirely normal; the cadaveric hue had promptly disappeared upon the removal of the constrictor, showing that the collateral circulation had not been interfered with. The gauze pack was now removed, and the large cavity remained perfectly dry. The sac walls were then inverted into the cavity, together with the overlying skin which formed two relaxed flaps. These mixed flaps of skin and sac were tacked down to the bottom of the sac on the Neuber plan of obliterating bone cavities, leaving no open space, but a deep depression in the popliteal space lined with skin.

In this way the sac was not disturbed from its surroundings, and no injury was done to the neighboring parts (nerves, collateral branches, veins, or joint), which would have suffered seriously from traumatism had an attempt been made to dissect the sac from its bed.

An aseptic dressing was now applied with a card-board splint and a copious cotton wrapping, over which a plaster-of-Paris bandage was applied from the toes to the middle of the thigh. The patient made a complete and uneventful recovery without the least evidence of

sloughing. When last seen, March 25, 1901, he was walking on the streets with good movement of the joint, except a slight limp caused apparently by adhesion of the skin scar to the gastrocnemius.

Commentaries. In this case it will be noticed that no direct traumatism could be discovered as the cause of the aneurism. While it is true that the popliteal was ligated immediately above the sac, it is also evident that the bleeding which occurred in the sac after the constrictor was removed could not have been controlled except by the suture of the orifice of the bleeding collateral within a diverticulum of the sac. It is also interesting to note that this operation was performed almost exclusively by regional anæsthesia of the sciatic, and the few drops of chloroform that were given only served to allay the mental anxiety without abolishing consciousness. The aneurism in this case was of the sacciform type, with a single large communication with the main artery. This opening could have been readily sealed by suture without obliterating the lumen of the artery; but as the popliteal had been ligated just above the sac, the operator does not feel justified in claiming this as a complete clinical demonstration of the special method advocated for such cases; the suture was so easily applied, and its obliterative effect so apparent that there is no reason to doubt that it would have been amply sufficient to secure hæmostasis had he omitted the ligature of the artery. In another case of the same type he would omit the preliminary ligature of the popliteal and simply close the orifice of communication in the sac, as is described elsewhere in the text.

Observation 4. *Aneurism of the left superficial femoral in the middle of the thigh; suture of the arterial orifices, with inversion of the sac; recovery.* (Abstract from Dr. L. J. Genella's notes.)—M. B., negro, laborer, roustabout, aged forty-five years. Admitted to Ward 2, Charity Hospital, March 25, 1901. Drinks moderately; denies syphilis, but admits that seven years ago had a general eruption, which suppurated. Has often had multiple "eating ulcers" of the genitals, with suppurating buboes. Seven years ago fell down the stairway of a ship and struck his left hip, hurting it severely. One year before admission first noticed a small lump in his thigh. It continued to grow slowly until two months ago, when he felt that it throbbed or pulsated. On examination a large femoral aneurism, ovoidal in shape, was recognized over the path of the artery, midway between the apex of Scarpa's triangle and the middle of Hunter's

canal. Digital compression over the common femoral was applied for two hours by resident students and members of the class. This had scarcely any perceptible effect, and another sitting of two hours' duration was held the next morning, with no effect. In view of the inefficiency of this treatment, a radical operation was advised and accepted. On March 30, 1901, the operation was performed under chloroform anæsthesia.

First step: A short incision over the tumor, beginning at the apex of Scarpa's triangle. The incision was made oblique and parallel with the inner border of the sartorius. No Esmarch bandage or constrictor was applied. The superficial femoral was exposed at the apex of Scarpa's triangle, and a traction loop of heavy silk was passed under the artery without tying it, and intrusted to an assistant. A pad of sterile gauze was placed over the artery to protect it during traction. Traction upon the loop of thread at once arrested the pulsation in the tumor and diminished its size. The artery was very large and thick, but soft and not calcareous.

Second step: After arresting the pulsation in the tumor by traction on the loop, the sac itself was freely incised by a longitudinal incision over five inches and a half in length. The sartorius was thin and spread over the entire sac, and the sac had to be incised between its fibres. The sac was very thin in its anterior portion. A gush of blood and serosanguinolent fluid immediately followed the opening of the sac. There was very little clot; some laminated fibres were adherent to the bottom. The cavity of the aneurism was large enough to admit an adult fist, and was fusiform in shape. After irrigating the cavity with saline solution, two large elliptical orifices were exposed at the bottom, corresponding to the cardiac and distal openings of the main artery in the sac. The openings were large enough to admit the index finger for a distance of one inch into the lumen of the vessel. A space of about two inches separated these two openings; but there was a shallow groove between them which suggested the continuation of the artery. The walls of the sac were smooth and thick, but not calcareous, at the bottom, and gradually became thinner as the tumor reached the surface. While these facts were being ascertained there was a steady and large flow of arterial blood into the sac, in spite of the vigorous traction on the femoral with the traction loop. Digital pressure, firmly applied on the distal side by another assistant, failed to stop the bleeding, which came distinctly from both orifices. This

could only be accounted for by the existence of large collateral branches which communicated with the artery at a short distance outside of the endo-aneurismal openings of the main trunk in the sac. While pressure was being applied directly upon the lower orifice the upper opening was quickly closed by a continuous fine silk suture passed through the entire thickness of the sac walls at the orifices. The suture was continued to the lower orifice, and this was closed in a similar manner. The provisional traction loop was now removed from the main trunk, and not a drop of blood escaped. The cavity of the aneurism was dry, and the hæmostasis was complete. A second continuous row of sutures was now applied on a higher plan, so as to protect the first line of sutures. These sutures were applied on the Lembert plan, so as to bring the intima in apposition over the broad surface. A curved surgical needle was used, and made to penetrate the *entire thickness* of the sac walls about the margins, which held perfectly well, and did not show the least tendency to tear or give way. This second row of sutures not only gave additional security from leakage in the first line of stitches, but, in addition, the floor of the aneurismal cavity was considerably reduced in size by this process.

Third step: The aneurismal cavity thus reduced was lined by inverting the skin margins with the relaxed edges of the sac and suturing the two to the bottom of the sac. (See Figs. 4, 5, and 6.) The aneurismal sac was thus left intact *in situ*, but so completely covered with skin that no raw surface remained exposed. The depression left by this procedure was filled with sterile gauze, and a copious cotton aseptic dressing was applied over the entire thigh. The color of the limb was excellent throughout.

Fourth step: The incision made over the artery at Scarpa's triangle for temporary compression with traction loop was closed with interrupted catgut sutures.

Fifth step: A padded card-board splint was adapted to the entire length of the limb, which had been previously wrapped in cotton-batting. The patient was put to bed in excellent condition one hour after the beginning of the operation, pulse 86. The patient made an uneventful recovery, but remained in the hospital until May 13th, as he served as help for some time after his convalescence.

Commentaries. This is the oldest patient in the series. There was no direct traumatism, but simply a yielding of the artery at the aneurismal site, in consequence, no doubt, the result of pre-existing

arterial disease. There was no positive history of syphilis, but the history given by the patient of previous venereal disease is strongly suggestive of syphilitic infection. In this case (a fusiform aneurism) it is worthy of notice that only a provisional traction loop was applied to the main trunk, and that this failed to control the bleeding, which came profusely from the collaterals which emptied into the main trunk above and below the sac. This bleeding only stopped after the suture of the arterial orifices, which held perfectly, notwithstanding the pathological nature of the aneurism.

NOTE.—The author acknowledges with grateful appreciation the valuable and kind assistance rendered by Dr. Quitman Kohnke, of New Orleans, in illustrating this article, and also to Miss S. Fry, 1041 Halsey street, Brooklyn, professional illustrator, who contributed many of the drawings.

DISCUSSION.

Dr. Arpad G. Gerster, of New York City.

It seems to me this modification of the old Antyllus operation really deserves considering, especially on account of the point, which is well taken, that it eliminates interference with those tissues and organs that are in apposition to the aneurismal sac. All who have tried to extirpate the aneurismal sac know how difficult it is on account of the adhesion between the sac wall and the adjoining parts. I am always afraid of the adhesion with nerves, and after the experience laid down in the fourth case cited, which shows that the adhesion to the interior of the aneurismal sac will occur, and that the superior surface will remain in contact in cases where it was attached laterally, I think the suggestions given will prove very valuable additions to our methods of procedure in these cases. Personally I shall certainly try them.

Dr. Joseph Ransohoff, of Cincinnati.

I would like to ask Dr. Matas what the ages of his patients were. I think the Association should be congratulated on this paper. I have had excellent results in treating aneurism. My reason for asking the question about the ages is perfectly patent. The cases have been those of ruptured arteries—in other words, traumatic aneurisms. In the cases of aneurisms which we get late in life the vitality of the sac wall is so low that it is better to have it out than in. In a clearly traumatic case simulating the ideal condition represented in the first two illustrations the operation would be just the one. It is very much like the ligation method. What should be done in that class of cases which come on late in life still remains to be determined, but in the acute cases this operation is excellent.

Dr. William J. Mayo, of Rochester, Minn.

I simply rise to relate a similar case which confirms the author's conclusions. About two years ago I assisted my brother in operating on a popliteal aneurism in which the dissection was very difficult. After getting down and turning out the clots from the sac he concluded it would be better to pack, and accordingly put in strips of iodoform gauze. He then took a running suture of catgut and tied the gauze firmly in position, continuing the packing to the surface. The

result was most excellent. The gauze checks the bleeding and closes all the open vessels, and the resulting granulations obliterate the sac. It is practically the method which Dr. Matas describes and which he has used a number of years. The Matas method is superior in that it leaves a perfectly closed wound in which healing is rapid, while the gauze-pack leaves a wound which must heal by the open method. We will certainly adopt the most admirable technique which the doctor has marked out in connection with his operation.

Dr. Arthur Dean Bevan, of Chicago.

I desire to call attention to one point. Dr. Mayo related his case to you last year, and I had a case of very large aneurism at that time. I had ligated it, but it was not successful. I adopted the suggestion of Dr. Mayo, with the idea of getting out the entire sac, but I found this very difficult. The central part of this huge sac was so rigid that it was impossible to bring the walls together. I had another case of very large fusiform aneurism where I was able with stitches to close up the openings, but I had to extirpate the centre of the sac in this case. Instead of pushing the superficial tissue down into the space I packed it with gauze, and the patient did very well. Dr. Matas' suggestion is a very valuable one.

Dr. Ellsworth Eliot, Jr., of New York City.

I think that something might be said in regard to the choice of operation as determined by the position of the aneurism. In one involving the femoral or popliteal artery the method suggested by Dr. Matas would be especially advantageous because of its resulting in the minimum amount of damage to the collateral circulation, being therefore less likely to impair the circulation of the extremity concerned. In the upper extremity, on the other hand, the excision of the sac would not be attended by the same risk of gangrene owing to the absence of terminal arteries.

I should think, also, that the choice of operation would be influenced by the nature of the aneurism; in those of the traumatic variety, I can understand how success could be achieved, but in those arising from pathological conditions, suture of the arterial orifice, as suggested, might not always be successful because of the lowered vitality of its wall. I wish Dr. Matas would discuss this point. In a traumatic aneurism the wall is in a very much better condition from the standpoint of its reparative value than is generally the case in the wall of

one resulting from previous atheroma. In this latter condition the aneurismal wall is poorly supplied with blood, and I should suppose that the union between its opposed surfaces would not always be satisfactory as the union in the case of the traumatic variety.

Dr. Matas (closing): Replying to Dr. Ransohoff, the age of my youngest patient was twenty-six and the oldest forty-five years. I appreciate the kind remarks that have been made and thank the Fellows who have spoken for their encouragement in the application of a new and comparatively untried method of treatment. Having had an experience limited to four cases, I would not pretend to cover all the conditions met in peripheral aneurisms that present themselves in practice, but the cases that I have described fairly represent the types that are most frequently met with in the extremities. I have not treated aneurisms of the neck or of the abdomen by this method, but I see no reason why the plan proposed should not succeed in these regions as well, provided the main artery can be provisionally controlled on the cardiac side. The chief objection which I have gathered from the discussion lies in the possible failure of the sutures to hold well in diseased or atheromatous tissues. This fear, which I also entertained in the beginning, has been dispelled by my later experiences. It should be remembered that while an aneurism may be indirectly of traumatic origin, the underlying condition is one of arterial disease. In the popliteal and femoral aneurisms which I have reported the traumatism was a simple strain which became effective as a cause solely because the arteries were already diseased. Hence the conditions found in my third and fourth case are practically those of chronic endarteritis and atheroma, such as would exist in an aneurism of the so-called senile or idiopathic type. And yet the healing in these cases was perfect. It is this fear of unsound or atheromatous tissue which held me back after my first experience in 1888, when I was compelled to suture a true traumatic aneurism. It was not until I had gone through two disasters, one a gangrene of the leg following a simple ligation of the femoral for traumatic aneurism—compelling an amputation of the thigh—and the other, the extirpation of a large femoral aneurism in which the vein was injured, and the excessive traumatism incident to this operation placed the patient's limb and life in great jeopardy —that I made bold to again try the method described. Now I am sorry that I did not continue with it as I had begun, because I am sure that I would have obtained far better results in my practice by

this method than by the ligature or by extirpation. I have always found that the tissue about the arterial orifices in the sac was more than sufficiently thick for firm apposition and always firm enough to hold the thread well. This is true not only of my personal cases, but also of the anatomical specimens which I have examined. The sutures hold well not only with a round needle but with the ordinary surgical and even the Hagedorn needle.

As to the advantages of the method which I have briefly referred to in the abstract, I would especially mention its superiority in dealing with the anomalous or dilated collaterals which so frequently bleed into the sac after securing the main artery. This condition was notably illustrated in my first case, a traumatic aneurism of the brachial. In this instance, after ligating the arteries above and below the sac it was found after excising it that the bleeding came from a large collateral which could only be controlled by the suture of the orifice within the sac. In my last case very free bleeding occurred in spite of the provisional compression of the exposed femoral immediately above the sac. This was caused by a large vessel which originated from the parent trunk just within the main orifice opening into the aneurismal cavity. The bleeding was immediately stopped by suture. By simply suturing the orifices of all the vessels opening into the sac the great traumatism of extirpation is obviated and an ideal hemostasis is obtained with a minimum risk of gangrene or infection. There are some points in the technique which future experience may modify, but the fundamental principle of substituting sutures for ligatures and working within the aneurismal cavity, and not outside of it, I feel confident will remain as a distinct gain in the future treatment of aneurism. The dangers of atheroma have been very much exaggerated; Berger, Heidenhain, and others demonstrated this long ago in regard to the ligation of diseased arteries in the immediate neighborhood of the sac.

THE PRESENT STATUS OF THE X-RAY AS A MEANS OF DIAGNOSIS AND A THERAPEUTIC AGENT.

By ARTHUR DEAN BEVAN, M.D.,
CHICAGO.

THE TRANSACTIONS of the Association for 1900 include a report of the Special Committee on the Medico-Legal Relations of the X-ray, presented by Dr. J. William White, the Chairman.

This report was very carefully prepared and presents quite completely the subject up to that date. I believe the knowledge accumulated in the last two years would suggest some corrections and additions.

In the first place, I believe it must be generally admitted that the X-ray has taught us very much about fractures and dislocations, and that the best work in this line cannot now be done without its aid.

One of the most interesting facts developed by the X-ray has been the very great difference between ideal results from the standpoint of good carpenter work and the actual results that we obtain by our present methods. The X-ray gives us the most accurate method of diagnosing the existence and exact character of a fracture. It is not possible by palpation, even the most educated palpation of the most experienced surgeon, to accurately determine the exact character of a fracture of the thigh, or, in fact, as a general rule, the exact character of *any* fracture. The information obtained by palpation and our older methods of examination is crude as compared with the information obtained with the X-ray. Even the existence of a fracture is often not ascertained by our older methods, where it can be frequently shown by the X-ray.

As examples: A considerable percentage of my recent cases of sprained ankles, so diagnosed, have been shown to be Pott's fractures with little displacement.

In the second place, the so-called fallacies of the X-ray, so ably discussed in the White report, are for the most part not fallacies of the X-ray, but are misinterpretations due to ignorance on the part of the individual who incorrectly interprets the skiagraphs or attempts to come to a conclusion on insufficient data. In intelligent competent hands the X-ray has no fallacies. We must never lose sight of the fact that the X-ray reproduces shadows and that the single picture gives only two of the necessary three measurements required to locate a body in space. When from faulty technique an X-ray plate does not give definite clear differentiation, it should not be accepted, and no attempt should be made to strain the eyesight and the imagination in the effort to see something which is not shown by the plate.

The statement in the White report of 1900 that "X-ray plates of fractures of the spine, the pelvis, the hips, and the base of the skull are not yet thoroughly satisfactory" no longer holds good to-day.

One point which I regard as of great importance in the White report, and one which should be somewhat modified, is the statement in regard to X-ray burns. We find in that report this sentence: "The evidence as to X-ray burns seems to show that in the majority of cases they are easily and certainly preventable." I believe this should be modified to read: X-ray burns may and do occur in the hands of experts, no matter what precautions have been employed to prevent them, and they are to be regarded as the occasional death from an anæsthetic, as accidents which may occur in the use of a powerful agent which is of so much value in surgical work that its use is a necessity.

In regard to the use of the Roentgen ray in locating foreign bodies and calculi, much has been accomplished in the last two years in the way of making more exact the location of such bodies by accurate measurements and by improved technique in obtaining a clearer differentiation of the tissues from such

bodies—the most notable example of this being in the finding of calculi in the urinary tract.

It requires an expert to use the X-ray intelligently, just as it requires an expert to use the microscope intelligently. The X-ray suffers to-day because almost every surgeon and many general practitioners regard themselves as competent to use the X-ray and interpret its findings without any special preparation. We must develop a group of men who are expert in the use of the X-ray, especially in the taking of skiagraphs, and we must ourselves become expert in interpreting the findings. For the performance of the best surgery it is almost as necessary to-day to have the services of such an X-ray expert at our command as it is to have the assistance of a well-trained pathologist. I would make a plea for the installation of a complete and efficiently conducted X-ray laboratory in every modern hospital.

I believe the general conclusions of the White report, from a medico-legal standpoint, are correct. The general practitioner should not be required by law to use the X-ray as a means of diagnosis, because of its expense, difficulty of transporting it, on account of its weight and bulk and danger of breakage, and because, also, it requires an expert to handle it and interpret the evidence which it offers. The law compels the general practitioner to possess simply ordinary knowledge, not expert knowledge.

The conclusions of the White report from a purely scientific basis and from the standpoint of the expert are not in keeping with our present knowledge of the subject, and should be revised.

The use of the X-ray as a therapeutic agent is a subject which has a very short history—practically not more than two years. During that time, however, and especially within the past year, it has demonstrated its claim to recognition. Chicago has in some ways been the hotbed of X-ray therapeutics (in this country, at least) during this period, a part of the work being done by scientific men and a part also by irregulars. I have taken the opportunity to investigate this side of the subject with some care. I have gone over the results of the work of Dr. W.

A. Pusey, Dr. James Nevins Hyde, Dr. Frank M. Montgomery, Dr. R. R. Campbell, Dr. Frank Billings, and Dr. Hektoen's histological investigations of the effect of the X-ray on carcinoma. These gentlemen have kindly furnished me with a brief report of their work, which I shall present to you. From these reports and my own experience, which I shall submit, conclusions as to the present status of the X-ray as a theraupeutic agent can, I believe, be arrived at fairly accurately.

Dr. Pusey furnishes me the following statement:

MAY 23, 1902.

DEAR DOCTOR BEVAN: The paper which I read before the Chicago Medical Society on February 26 reported my results up to practically the first of January, 1902, in malignant diseases or affections closely allied thereto. Up to that time I had treated four cases of lupus, three of which were well and one of which failed to respond to treatment. The first of these cases has been well for eighteen months, and the second for twelve months, the third for eight months. The fourth case, which had not responded to treatment, has improved very greatly since my report was made, and now bids fair to get entirely well. I have also treated one case of tuberculosis in the glands of the neck in which unhealthy sinuses remain on both sides of the neck after operation, and this case has now been practically well for three months.

In that paper I reported eight carcinomas of the skin which had all been healed, with healthy scars, under X-rays. Most of these cases were cases that had entirely failed under operative procedures and had become inoperable. I have added a considerable number to this list since the publication of that paper.

I also reported six cases of recurrent carcinomas of the breast, all of these inoperable, in which three have been symptomatically cured. The first of these cases, a recurrent carcinoma of the breast with extensive involvement of the chest wall and axilla, has been symptomatically cured since October, 1901. The patient has been improving constantly in general health up to the present time. For a long time we feared that there was a metastasis in some other part of the body, but the improvement in her health is continuous, and there seems to be good reason to believe that she is well of her carcinoma. The other two cases are symptomatically cured. In three cases I failed. Two of these were cases that had treatment only a short time, and cannot

fairly be charged as failures. In the sixth case the treatment was ineffective after persistent efforts, and has to be charged as a failure against the method.

I reported six cases of deep-seated carcinoma of the head and neck which had been treated, all of which were failures. Five of these were deep-seated carcinomas of the neck of the most hopeless character. The sixth case, which was Case XXIV. of my report, presents an interesting subsequent history. This case was a carcinoma involving all of the tissues around the orbit. The patient had previously had an epithelioma of the lower lip which had been removed without recurrence. There was every evidence of the involvement of the intracranial tissue around the orbit. He was under treatment for two months with very great relief from the acute pain which he had suffered, and decided shrinkage in the tumor. Then, however, the effect seemed to be lost, and, in spite of a vigorous irritation with X-rays, evidences of intracranial pressure developed, and Dr. Wilder and I concluded that the case was hopeless, and he was discharged as incurable and recorded as a failure in my report. He was sent home on November 23. On April 29, Dr. T. Sprague, of Sheffield, Ill., who had seen him when he returned home, wrote me as follows: "I saw him yesterday, and he presents an entirely different appearance. The mass that occupied the orbit has shrunken, allowing the eyelids to close; he is free from pain, eats and sleeps well, and uses no anodyne. There are a few little nodules on the nose near the commissure of the eyelids, and with that exception he looks well. I am sure it is a result of the X-ray treatment."

I reported upon five carcinomas of the abdominal cavity in which there had been no conclusive evidence of any checking of the disease.

I reported one sarcoma of the neck which had been dispelled by X-rays, but in which after five months without treatment there was recurrence, taking place at the original site. Since that report that patient has again been under treatment. It was interesting to observe that there had been a greater recurrence at the site of the operation in the left side of the neck than on the right side, where the treatment had been by X-rays. Under exposures these tumors have entirely disappeared again.

I reported at that time two cases of pseudoleukæmia treated by exposures to X-rays. The second of these cases shows no evidence of recurrence without treatment since February 1st. His health is

entirely restored. The first case had an enlargement of the glands of the neck recur in April, but these have disappeared under X-ray exposures. I have since treated another case of Hodgkin's disease in which the patient was in the last stage of cachexia, a case of several years' duration which had steadily gone from bad to worse. The glands in this case have entirely disappeared and the improvement in the man's health is little less than marvellous.

Yours truly, W. A. PUSEY.

[In practically all of these cases the diagnosis was made histologically and by someone other than myself. W. A. P.]

Dr. James Nevins Hyde, Frank Hugh Montgomery, and Oliver S. Ormsby, of Chicago, give me the following facts on "Radiotherapy and Photography in Cutaneous Diseases:"

For phototherapy they use the Sequeira modification of the Finsen light. In radiotherapy they use for superficial lesions a moderately soft tube, varying details of application according to the case and the peculiarities of the individual, recognizing the fact that individuals vary greatly in the way in which they respond to this treatment. While it is too early to draw definite conclusions regarding the relative value of radiotherapy and phototherapy, it would appear that phototherapy, though in most cases slower in action and less convenient of application, produces better cosmetic results; and that in some instances, especially in tubercular disease, it is found more rapid in producing results than the X-ray.

They have treated forty-one cases of carcinoma, a large majority being of the superficial type, known as epithelioma or rodent ulcer. In fifteen patients the disease was entirely replaced by a scar which in most instances is soft and smooth. Among the fifteen cases were seven in which growths had occurred after removal with the knife, curette, or paste, and two in which rodent ulcer of the lip had involved deeper tissues quite extensively. Of twenty-three cases yet under treatment, ten are nearly well, while thirteen show little or no improvement. A carcinoma of the rectum and one of the breast have shown no improvement after repeated treatments with a high-tension tube. A carcinoma of the cervix has improved very greatly.

The growths which disappeared entirely were given from twelve to fifty-four exposures during a period varying from three weeks to six

months, the time and number of treatments required depending upon the character of the lesion and the susceptibility of the individual to the treatment.

Of six cases of lupus vulgaris, two are apparently completely relieved of the disease, while four are very much improved. In a number of other cases of cutaneous tuberculosis several have made decided improvement, while others show little or no progress toward recovery. Of eight cases of lupus erythematosus treated with the Finsen light, two have almost completely recovered, three show decided improvement, and three little or no progress.

In the twenty-six cases of psoriasis fairly uniform results were obtained. Even areas of long standing cleared up completely and quite promptly after a few exposures to the X-ray; but the treatment did not prevent a recurrence of the disease, either in the old or in new areas. In alopecia areata the treatment was beneficial in five, and of no value in thirteen cases. In six cases of ringworm of the scalp no benefit was derived from the treatment. In five cases of hypertrichosis the hairs were removed in from twenty-six to sixty-seven treatments. In one there was a partial recurrence of the growth at the end of two months.

They had used the treatment in a number of other diseases, including chronic eczema, sycosis, rosacea, acne, morphœa, keloid, hypertrophic scars, hypertrichosis, etc., the results being in some instances markedly beneficial, but as a rule, unsatisfactory.

The writers believe that in certain cases the radiotherapy and phototherapy form the best-known means of treatment, but that their field of usefulness will prove to be limited.

The report of Dr. S. S. Campbell, Professor of Skin and Venereal Diseases, Chicago Polyclinic, is as follows:

Radiotherapy depends upon the fact that the skin undergoes a peculiar transformation under the influence of rays from the Roentgen light. In other words, a so-called Roentgen dermatitis is set up. The fundamental principles of the technique embrace the following, and must be strictly observed:

The active agent is embodied in the X-rays which come off from an X-ray or Roentgen tube. All kinds of X-rays do not act alike; rays of a moderate penetrating power act more powerfully than those of greater penetrating power. The degree of change which can be

brought about in the skin depends upon the intensity of the radiance. The medium soft tubes are the tubes best suited for dermatological use and diagnostic purposes, as they possess a moderate amount of air, transform almost the entire electrical force into Roentgen rays, give an intense radiance and one of moderate penetrating power.

In the following cases microscopic findings substantiate the clinical diagnosis:

Case I.—Aged forty-nine years. Massive carcinoma of left breast; pain entirely relieved after six exposures of fifteen minutes each, 10 cm. Contracted pneumonia and died.

Case II.—Aged fifty-five years. Massive recurrent carcinoma of left breast. Pain was entirely relieved after eight exposures. Patient has gained twenty pounds, has been under treatment four months, daily exposures of from fifteen to twenty minutes, at from 10 to 20 cm. Tumor mass softened and decreased to one-half its original size. Still under treatment.

Case III.—Aged forty-two years. Walnut-sized recurrent carcinoma of left breast. Entirely disappeared after ten weeks' treatment, daily exposures, fifteen minutes, 10 cm.

Case IV.—Aged thirty-six years. Almond-sized clavicular glandular recurrence. Disappeared after nine weeks' treatment, daily exposures, fifteen minutes, 5 to 15 cm. Right breast removed.

Case V.—Aged fifty-six years. Hen's-egg-size recurrent carcinoma, left side. Disappeared after four months' daily exposures, twenty minutes' each, 10 to 20 cm.

Case VI.—Aged fifty-one years. Small recurrence in scar, right side. Entirely disappeared after ten weeks' daily exposures, fifteen to twenty-five minutes, 10 to 20 cm.

Case VII.—Aged forty-four years. Hickory-nut-size recurrence in scar, right side, with slight clavicular glandular involvement. Disappeared after three months' daily exposures, twenty minutes, 10 to 20 cm.

Case VIII.—Aged thirty-two years. Almond-sized recurrence just below left clavicle. Disappeared after eleven weeks' daily exposures, twenty minutes, 15 cm.

Case IX.—Aged fifty-three years. Recurrent carcinoma of tongue. No improvement after six weeks' daily exposures, fifteen minutes each, 10 cm. Stopped treatment.

Case X.—Aged fifty-eight years. Massive recurrence, one and one-half years after amputation of right breast. Has been under treat-

ment six weeks' daily exposures, fifteen minutes, 10 to 15 cm. Marked improvement.

Case XI.—Aged sixty years. Small epithelioma of cheek. Disappeared after five weeks' daily exposures, ten to fifteen minutes, 10 to 20 cm.

Case XII.—Aged fifty-two years. Epithelioma, left side of nose. Disappeared after six weeks' daily exposures, fifteen minutes, 10 to 20 cm.

Case XIII.—Aged forty-nine years. Epithelioma of lower lip. Disappeared after six weeks' daily exposures, ten to fifteen minutes, 10 to 15 cm.

Case XIV.—Epithelioma, left side of forehead. Healed after five weeks' daily exposures, fifteen to twenty minutes, 15 to 20 cm.

Case XV.—Epithelioma, size of a dime, just below left eye. Healed after four weeks' treatment, daily exposures, fifteen minutes, 10 to 20 cm.

Case XVI.—Aged sixty years. Extensive recurrence, two years after removal of right breast. Has been under treatment four months, daily exposures, fifteen to twenty minutes, 5 to 20 cm. Pain relieved; no change in tumor mass.

Case XVII.—Aged sixty years. Extensive recurrence, existing eight months. Appeared two years after removal of left breast. Pain relieved. Patient died of carcinoma after six weeks' treatment, daily exposures, fifteen to twenty minutes, 5 to 15 cm.

Case XVIII.—Aged forty-nine years. Recurrent carcinoma, size hen's egg. Has been under treatment two months, daily exposures, fifteen minutes, 10 to 20 cm. Pain relieved. No diminution in size of tumor.

Dr. Billings gives me the following report of two cases of tuberculous peritonitis, which I had the opportunity of personally observing:

Case I.—Man, aged forty-five years, white, American by birth, married, restaurant keeper.

Trouble began two years ago, characterized by loss in weight, loss of appetite, distention of the abdomen, progressive weakness. Tuberculin test positive. X-ray treatment began, but discontinued because patient about this time developed acute pleurisy and was unable to be moved.

Case II.—Man, aged twenty-seven years, Italian, married, liquor dealer. Four months ago, October 20, 1901, patient was taken ill with what the doctor thought to be typhoid fever. At the end of eight weeks a large swelling appeared in the left hypochondriac region, extending toward the right beyond the median line and downward to the umbilicus. The patient's temperature ranged from normal to 102.5. Patient was confined to bed for eleven weeks. At the end of this time he was able to be up and about, although he was very weak.

On February 26, 1902, patient was admitted to the hospital. Under anæsthesia a mass could be felt in the upper part of the abdomen, centrally located, and indefinite in outline. Per rectum several enlarged glands were palpable. Temperature, 90° to 101.2°.

Three milligrammes of tuberculin gave a typical reaction, the temperature rising to 103.6°. Patient was put to bed and the X-ray applied over the swelling in the abdomen every second or third day for a period of five to ten minutes for five weeks. A severe X-ray dermatitis developed, but healed under appropriate treatment. Patient had no medicinal treatment whatever. He increased in weight, his appetite became better, the swelling in the abdomen became smaller, and the temperature became normal. Patient left the hospital April 9th, and reported one month later that he was well.

Case III.—Mr. H., blacksmith, aged thirty-three years, white, married. Had pleuropneumonia one year ago, and was confined to bed two months. For two months more he was unable to work. Right chest was tapped and a pint of clear, yellowish fluid withdrawn. Patient recovered sufficiently to resume his work until his admission to the hospital.

Three weeks before admission patient began to feel a sense of fulness in the abdomen, most marked after meals. The abdomen enlarged and there was a sense of burning in the rectum. Patient had lost eight pounds in the last three weeks, and has dyspnœa on going up stairs, temperature varying from 98.6° to 102°, pulse, 90 to 116, respirations slightly accentuated, abdomen uniformly enlarged, and evidence of free fluid present. Two milligrammes of tuberculin gave a distinct reaction and a rise in temperature to 105.2°.

Patient put to bed and X-ray applied to the abdomen every second or third day for a period of five to ten minutes at a sitting for four weeks. At the beginning of the treatment patient weighed 170 and the girth measurement was forty-four inches. At the time of dis-

charge, seven weeks after admission, his weight was 176 pounds and girth measurement thirty-four inches. Patient is still under treatment twice a week, and at the present time, three weeks after his discharge from the hospital, he weighs 186 pounds, and his girth measurement is thirty-three inches. Patient feels well and is doing light work.

The following table shows the relation of weight and girth measurement at different times during the treatment. Fluid has entirely disappeared.

Date.	*Weight.*	*Girth.*
Admitted March 11, 1902	170 pounds	44 inches
" March 28, 1902	159 "	34½ "
" April 15, 1902	167 "	34 "
Discharged April 28, 1902	172 "	34 "
Reported May 19, 1902	186 "	33 "

These patients were kept in bed during the treatment, and Dr. Billings believes the rest an important aid in the treatment.

In our surgical service at the Presbyterian Hospital we have employed the X-ray in a number of cases of lupus, epithelioma, recurring carcinoma of the breast, deep-seated carcinoma of the larynx, œsophagus, and superior maxillary, and in sarcoma of the pelvis, abdomen, and foot. We have been successful in curing our cases of lupus where we had a limited area and had ulcerating type of lupus to deal with. In one case of very extensive lupus of the face where there was no ulceration, but an area irregularly probably five by four inches, thickly sprinkled with lupus nodules, we failed to produce any curative effect even after obtaining rather marked reaction. In our epithelioma of the rodent ulcer type we have found without exception repair follow the treatment, but in some cases glandular involvement appeared even while the patient was under treatment and even though the superficial lesion cleared up.

In our cases of recurring carcinoma of the breast we have noted the disappearance of superficial nodules, even of considerable size, but deeper recurrence continued to develop in spite of the treatment. We obtained in our deep-seated carcinomas no beneficial results whatever.

In deep-seated sarcomas we were unsuccessful, but succeeded in producing the disappearance of a sarcoma of the foot which began in the second metatarsal bone and recurred after surgical removal.

Personally, when I first began to investigate this work, I was absolutely skeptical as to its value, but I have seen such definite results

acccomplished in the way of curing epitheliomas and lupus and in the disappearance of recurring carcinomas after breast amputations and of sarcomas of considerable size so situated that they could be readily penetrated by the ray, that I have become fully convinced that in the X-ray we have a therapeutic agent of marked value in the handling of these conditions.

The attitude of the regular surgeons has been that of skepticism in regard to the X-ray as a therapeutic agent, and they have not given the subject the careful consideration to which I think it is entitled. I believe that one of the most important questions that could be discussed by the Association at its next meeting will be the question of the action of the X-ray on malignant growths. Professor Hektoen has investigated this subject in a histological way and found that the epithelial cells in a carcinoma submitted to the X-ray broke down, became granular, and their places were eventually taken by new connective tissue.

DISCUSSION.

Dr. Willy Meyer, of New York City.

We cannot too strongly indorse the stand taken by Dr. Bevan, that carcinomatous conditions primarily belong to the surgeon. If we have to deal with epithelioma of the face, for instance, we might well try the X-ray first. But if a patient comes to us with an operable malignant growth, he should primarily be submitted to operation. In this way, lately, a patient with a well operable carcinoma of the breast was sent to me for X-ray treatment. I refused, and proposed the radical operation. She then went to another surgeon. We must educate the medical man not to make such a mistake as to advise patients with operable malignant growths to request X-ray treatment as the first step. The application of the X-ray surely means an immense progress. According to our present knowledge it appears to be our duty, after having done the operation, to advise these patients to undergo treatment by the X-ray, as it seems that microscopical deposits can be absorbed or destroyed in this way.

Dr. Albert Vander Veer, of Albany, N. Y.

For the past six months we have made an earnest effort to treat the cases like Dr. Bevan says, and some cases have proven to us that the method is one which gives great encouragement. We have some photographs almost like his. One of our internes has paid special attention to the use of the machine, and has treated two cases almost precisely like Dr. Bevan, in which there has been marked improvement. Our patients are beginning to look to us to use the X-ray, and they have asked me to do so. The intelligent public expect the X-ray in cases of carcinoma. I was asked to operate on one case where the patient wanted the X-ray used first. The deep-seated cases that have not been touched are not proper for the use of the X-ray. The question is, Are we going to be able to treat these cases without operation at all? So far our own investigations have been only where the skin has broken or in which there is a secondary deposit.

Dr. L. L. McArthur, of Chicago.

I would like to continue the line of thought suggested by Dr. Vander Veer. It has been our practice in Chicago to approach the

patient in the same way. We say we can take out the half a pound or more this growth weighs, thus throwing that much less work on the X-ray. We make it a practice to remove all that is possible in the way of surgical interference ; and after explaining the situation to the patients they are willing to continue the use of the X ray in a prophylactic way as well as for the purpose of destroying any small remaining traces of growth. I want to add my testimony to the efficacy in certain cases of malignant and other ailments. I have a photograph of an extensive carcinoma operated upon by Dr. Owens, and later by Dr. Murphy, on which I operated and thought to have effected a cure. After a short time a typical recurrence took place. In that case much good has been done by the X-ray, the recurrence disappearing and remaining free over a year. Another picture shows very extensive lymphosarcomata of the so-called Hodgkin's type, which was seen by a surgeon in Chicago, and immediate operation advised. The patient unwilling to have the operation performed went to Dr. Fenger, who advised against operation. I also advised against operation. The patient was advised to try arsenical injections, but making no progress I sent him to Dr. Pusey. In three weeks the growth exposed to the X-ray had almost disappeared, the tumor I had been injecting not diminishing. I sent him again to Dr. Pusey, as he could not do good work with his arm, owing to there seeming to be some interference in his movements. The third, a case of carcinoma of the breast, was amputated. This likewise disappeared in three weeks, painstaking dissection of axillary lymphatics being done, but in the dissection it was not all gotten out. After the secondary operation for recurrence, now one year later, it healed ; induration is no longer to be felt. I believe there is little danger of our being too enthusiastic. This is an aid in treating malignant disease, and should be used and its value studied.

Dr. A. J. Ochsner, of Chicago.

I wish to say one word regarding the attitude this Association should take toward this subject. Many of the photographs exhibited by Dr. Bevan are of my patients, and among them there are two of whom, after my former experience with similar cases, I should say positively that they would not be living to-day had they been operated upon again instead of being placed under the X-ray treatment. The amount of life that they have had since that time is of course a clear gain, but they are not in a condition in which we

could say positively that they are going to live a certain length of time, although they are at the present time apparently cured. I am speaking of cases of secondary recurrences, which are more severe than primary recurrences. One was a case of sarcoma of the neck; the other a carcinoma of the breast. I have also seen several of the other cases, and all of our Chicago Fellows have seen many of those cases. We have two of the best, most conscientious, and most scientific men in the medical profession in Chicago who began this work early, being stimulated by what they had seen abroad. We have been fortunate in having such men to send our cases to, as they are all observed very carefully. Although we should not state that this treatment will cure carcinoma or sarcoma until we have observed these cases for a long time, we should certainly not oppose careful men developing this subject clinically, as I am sure it will bear fruit.

Dr. Charles A. Powers, of Denver, Col.

This is one of the important subjects of the day. My own experience with the use of the X-ray in cancer has been limited to few cases, but the results have been such as to lead me to continue. One case in particular has impressed me forcibly. A woman who underwent a complete operation for very large, rapidly growing, nodulary cancer of the breast last November speedily showed symptoms of spinal relapse. The pain was intense, spasmodic in character, but completely disappeared under the X-rays. At the same time recurrent local nodules have materially diminished in size. There is no doubt in my mind that the relief is due to the agent used. The cases which Dr. Bevan has related and the pictures which he has shown cannot fail to impress all who are fair-minded. The word "cure" is not to be used at this time, but when any agent effects diminution in size or disappearance of malignant growths it is our duty to investigate that agent most thoroughly.

Dr. James E. Moore, of Minneapolis, Minn.

I personally feel that we owe a debt of gratitude to Dr. Bevan for bringing this subject before us. I was present at Dr. White's report, and we were all considerably discouraged by it. I cannot quite agree with Dr. McArthur that this Association is in no danger of slipping over, because I think we have not yet forgotten Koch's lymph. We may become over-enthusiastic, but we must certainly derive from it

whatever benefit we can. I agree with Dr. Ochsner that we should assume a strong, hopeful, conservative attitude toward the matter. I have been striving to bring about such a condition of affairs in Minneapolis as they have in Chicago. A number of physicians have bought the X-ray machines, but I have not, because I didn't think I should have time to take it up properly. I did not think the work that I could hire done would be of any service, and I have no confidence in my own interpretation of the work done. One of my colleagues has taken this matter up, and we shall encourage him in every way. We can get out of it all the good there is in it without doing any harm. We can continue to operate when operation is indicated, and at the same time give the patient the benefit of the X-ray.

Dr. William L. Rodman, of Philadelphia.

I am very much interested in the report of Dr. Bevan, and trust that I, too, may become as optimistic as he. I would ask that this Association appoint a committee to get the experience of the different members of the Association, and report to us at the next meeting.

(Dr. Bevan requesting that the matter be referred to the Committee on Programme, the suggestion was agreed upon.)

Dr. William L. Estes, of South Bethlehem, Pa.

While the opinions of the various members are undoubtedly, in the main, true, and while one not absolutely prejudiced must admit that there is a great deal in the therapeutic value of the X-ray, yet we must also admit that the whole thing is *sub judice*. Dr. Vander Veer struck the right cord when he said, "The public are studying the matter, as well as the profession." The laity are now beginning to refuse operation for tumors, and insisting upon the new treatment. We may do a great deal of harm by encouraging exaggerated ideas. No surgeon will doubt that the proper way to treat malignant growths is by the knife. Some growths can be extirpated, and if they can be cured by the knife, then why should we not try the quicker and surer method? We will not be carried off our feet, but we may carry the laity off their feet.

As the use of the X-ray in fractures and foreign bodies, I have had some experience, and I know that what Dr. Bevan has said with reference to the importance of skill in the use of the X-ray is absolutely true. I have seen some of the worst sort of mistakes made by incompetent

men and work done by poor operators. An ordinary X ray photograph done by an inexperienced person is worse than useless. I have been misled time and time again. I have cut down where the X-ray photograph seemed to show the object, but found it absent or some distance from the place indicated. I consider the fluoroscope much better in fractures and the location of foreign bodies in the superficial tissues.

Dr. Bevan. The most important point is the putting of this work in the hands of experts. The surgeon doing ordinary work is incompetent to use the X-ray, and this brings us to the necessity of using men who are competent to do this work. Every modern hospital should have an X-ray laboratory, both for diagnostic and therapeutic purposes, and this man will have to be paid just as you pay your pathologist. It is the only way to have X-ray work done. As to the position we should take in the matter, I do not want to be over-enthusiastic; but I am simply astounded by the results I have seen in the investigation of this subject. We should take it up and go through it thoroughly, as there is certainly something in it, for this has been demonstrated. It belongs to us to determine how much value it possesses. It is too valuable to leave to the quack.

As to the appointing of a committee, I rather think this would be a mistake, and believe it would be a better plan to suggest to the Council that one of the features of next year's programme be a symposium on the X-rays.

MORCELLEMENT AND BISECTION OF THE UTERUS IN COMPLICATED ABDOMINAL HYSTERECTOMY.

By WILLIS G. MACDONALD, M.D.,
ALBANY.

The employment of morcellement and bisection of the uterus in complicated vaginal hysterectomy are both procedures of such distinctive merit that they require no argument to compel their employment when the necessary indications present. The facility that both these procedures have afforded operators who employ the vaginal route extensively, even in the removal of fibroma of considerable size, led me to adopt similar plans of procedure in complicated cases when the conditions precluded the ideal operation.

The employment of morcellement in supravaginal hysterectomy in a limited way may be said to have antedated its employment by the vaginal route. Those operators who for a number of years treated the pedicle after supravaginal hysterectomy by ventral fixation and the employment of serre-nœud were often compelled in thick pedicles to remove by enucleation not alone deeply seated tumors, but portions of the uterine tissue as well, in order that a suitable pedicle might be formed.

In my own technique for supravaginal hysterectomy, after the year 1896, I employed to the exclusion of all others the side-to-side method introduced by Baer, and subsequently so much improved and more clearly demonstrated by Kelly. The employment of this operation led in uncomplicated cases at once to far more satisfactory results and a greatly lessened mortality. However, in certain groups of cases where the fibroid

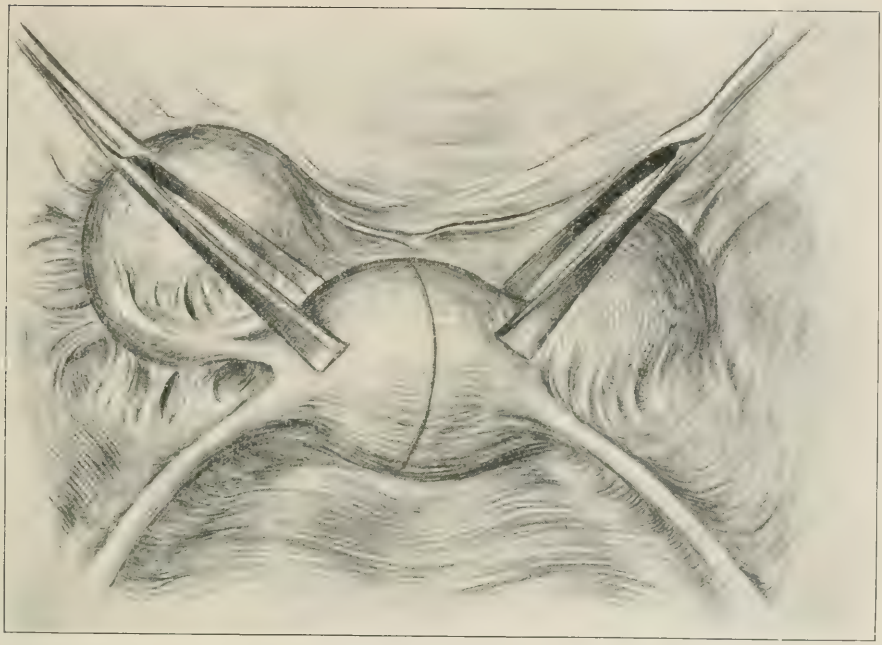


FIG. 1. Showing the line of incision most commonly employed in bisection of the uterus for the removal of double chronic inflammatory diseases with extensive adhesions and abscess.

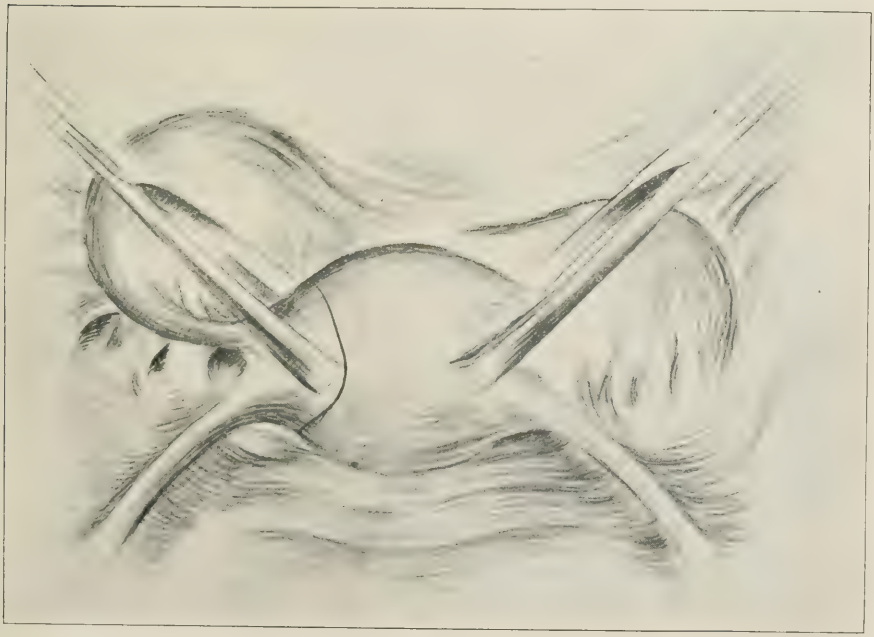


FIG. 2. Showing the line of incision involving one or other horn of the uterus when the division is made laterally to avoid entering the cavity of the uterus.

tumors were situated deep in the pelvis, distending the broad ligament, or becoming supraperitoneal, deep in the pelvis, or associated with inflammatory or cystic changes in the ovaries, this operation presented the most serious difficulties. Such conditions may be very clearly described as pelvic fixation or incarceration as associated with new-growths in the uterus and appendages.

On the 18th of August, 1898, I undertook the removal of a not unusually large fibroid tumor located in the posterior wall of the uterus and extending into the cul-de-sac of Douglas by the vaginal route. After making my preliminary incisions for vaginal hysterectomy, securing the uterine artery on each side by clamps, I found that it was utterly impossible by any means then at hand to draw down either the tumor or the cervix sufficiently to continue the operation. At the moment I was quite unable to account for the fixation of the uterus, and after a careful survey of the field the vagina was tamponed carefully with gauze, the patient placed in the Trendelenburg posture, and the abdomen opened. Clearing the field of operation, many adhesions of the omentum were separated from the fundus of the uterus and appendages, and locally on either side of the uterus were found a dermoid cyst, practically of the size of an orange, involving each ovary. Where by the vaginal route I had been unable to draw the uterus down into the vagina, by the abdominal route it was equally impossible for me to draw it upward into the abdominal wound. Finally, a clear space was dissected along each lateral border of the uterus, so that a heavy broad ligament clamp could be adjusted close to the horn, and extending downward toward the cervix to the point where the vaginal dissection had been made. The fundus was seized after the fixation of these clamps, and a median incision made through the top of the uterus, commencing at its posterior surface and entering into the capsule of the fibroid previously described. As soon as the fibroid had been fully divided, each half was enucleated with great ease and without hemorrhage. This allowed the fundus to be brought well into the abdominal section and the bisection of the organ completed. Seizing the

cervix from below, the uterine artery having been previously secured by clamps now lying in the vagina, the round ligament on either side was secured by artery forceps, and the enucleation of the dermoids completed with great ease and without rupture from below upward, finally securing the ovarian vessels by a clamp at the border of the pelvis.

The obstacles presenting in this most difficult operation disappeared immediately with the bisection of the uterus and the enucleation of the largest fibroid in the posterior wall. I was greatly impressed with the ease with which the adherent dermoid cysts separated themselves up from the pelvic peritoneum when the fingers were introduced from below, more particularly after the round ligament had been secured. It will be noted that in this case no ligature was placed until the entire disease had been removed. The vessels were now tied separately at three points, viz.: the ovarian artery, the round ligament, and the uterine artery, and the entire operation completed by an overlying continuous suture, closing the peritoneum and the pelvis. The abdomen was closed without drainage, and the patient made a prompt and most satisfactory recovery.

Subsequently from time to time I employed similar methods for the removal of deep-seated fibroid growths. The bisection of the uterus was not always mesial, but frequently commenced at one cornu, entering the capsule of the large fibroid, which was enucleated at once, and finally entering the cervix in the median line at the point of amputation. Occasionally, however, this median incision of the posterior wall of the uterus was carried directly downward until the cul-de-sac of Douglas was opened, care being taken all the time to fix the divided portions of the uterus with strong forceps of the museau pattern in the manner to be subsequently described. It is quite as easy to do a complete hysterectomy in this manner at once as it is to make a supravaginal amputation and remove the cervix afterward. The incision, when a complete hysterectomy is contemplated, must be carried carefully in the middle line until the cul-de-sac of Douglas is opened into the vagina, when the divided portions of the cervix are firmly grasped, pulled strongly

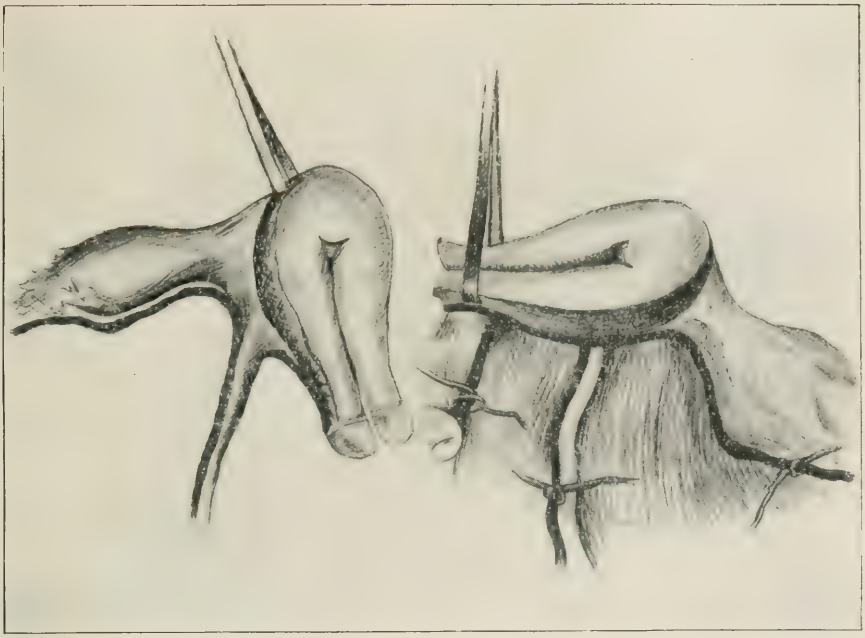


FIG. 3. Illustrates the manner of seizing the lower segment of the uterus and the transverse section of the cervix. Also illustrates the points of ligature in bisection.

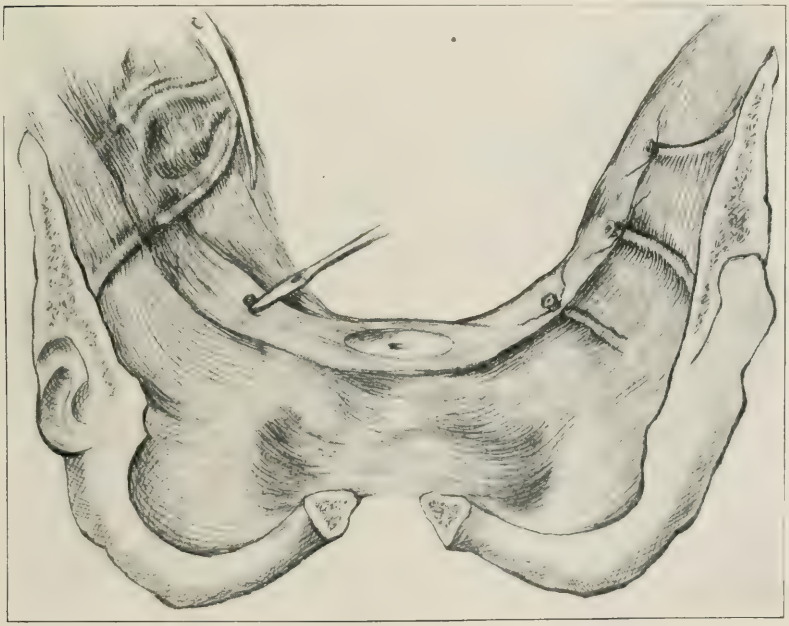


FIG. 4. (Schematic.) Illustrates the partial evacuation of the pelvis with ligatures in place on the left side, the cervix divided, the right uterine artery seized by a clamp, and the right adherent uterine appendage ready to be removed by enucleation.

upward, and the vaginal mucous membrane incised close to the cervix. Great care must be exercised in dividing the last fibres of the uterus in its relation to the bladder. When once done, the uterine artery presents itself at the side of the cervix, becomes at once accessible to the application of a strong hæmostatic forceps, and the subsequent lateral dissection may be completed at leisure. For the most part the entire uterus and appendages are removed before any ligatures are applied, although there can be no objection to the employment of ligatures as vessels present.

Between the time of the first case presented, in August, 1898, and November, 1900, I had occasion to employ this method either of bisection alone or bisection associated with morcellement in suprapubic hysterectomy eight times. All of the patients recovered without serious complication.

At the meeting of the Southern Surgical and Gynecological Association in 1900, Dr. Howard A. Kelly presented a paper illustrating the utility of bisection of the uterus in some of the more serious cases of chronic inflammatory disease. From my previous experience I was greatly struck by the advantages presented by this method, and have employed it in a very considerable group of cases, now nearly seventy, in all with most satisfactory results. I think there is no essential difference in the technique employed by Dr. Kelly and myself.

In presenting to you the methods which I have found most satisfactory, I probably can best describe the same to you by calling your attention to the series of drawings which I present to you.

The propriety of the extirpation of the uterus, either completely or by a supravaginal amputation, can hardly enter into a discussion of the technique of this operation, further than to say that in my experience a large number of women suffering from the more malignant forms of inflammatory pelvic disease do not secure the required relief by the removal alone of the uterus and appendages, that many of them subsequently continue to menstruate, suffer from hemorrhage and profuse leucorrhœal discharges, and chronic pain; and I have had occasion in a

number of cases to subsequently remove the uterus where salpingo-oophorectomy had been done as a preliminary operation. Therefore, where any considerable evidence exists of a septic uterus, even though I have no other reason, yet I remove it, together with the appendages, at the time of the primary operation. This is particularly true when I find on each side of the uterus an ovarian abscess with multiple adhesions and possible intestinal fistula. Under such conditions a small space is cleared away by dissection, exposing the fundus of the uterus, the horn of which is grasped with a heavy forceps and held at tension by an assistant. The matter of tension is a very important one. When the tissues are well stretched the vessels are close, and very little hemorrhage follows the bisection. In this way the uterus may be divided through the line of the cervix, leaving a small portion of the abdominal cervix as a stump. Personally, I prefer to carry this incision down the posterior wall of the uterus first, then through the anterior wall until the border of the bladder is reached, which can be easily separated by the tip of the finger or scalpel from the anterior surface of the uterus, and at this time the exposed portion of the cervix is seized by a second pair of heavy forceps, dragged upward toward the abdominal wound, and cautiously divided laterally. As the lateral wall of the cervix is reached it is a matter of supreme importance that the last strokes of the scalpel should only divide individual fibres, and it is far better to tear the last fibres of the cervix by upward extension of the most deeply seated forceps. In this way the uterine artery is exposed without danger of accidental hemorrhage, and secured by forceps. These forceps should not grasp a large amount of tissue. After securing the vessels now held by clamps the remainder of the procedure is identical with the Kelly side-to-side method for supravaginal hysterectomy. Under certain conditions it may be desirable to completely remove the organ and introduce gauze drainage in the deeper structures of the wound leading upward into the vagina. It is a simple matter, after the introduction of the drain, to close the peritoneum by a running stitch, closing it from the pelvis, the area of dissection.

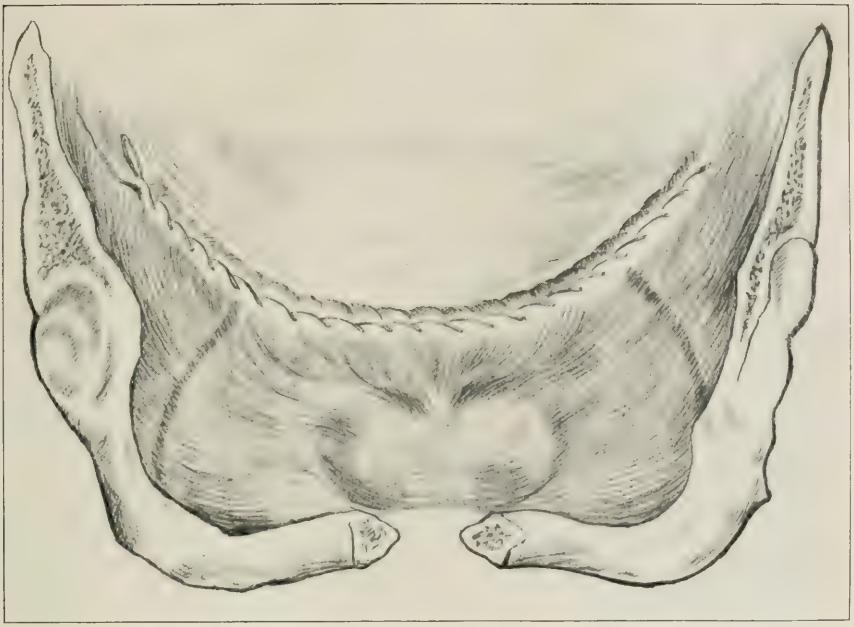


FIG. 5. Showing the closed line of continuous pelvic suture from side to side, which completes the operation.

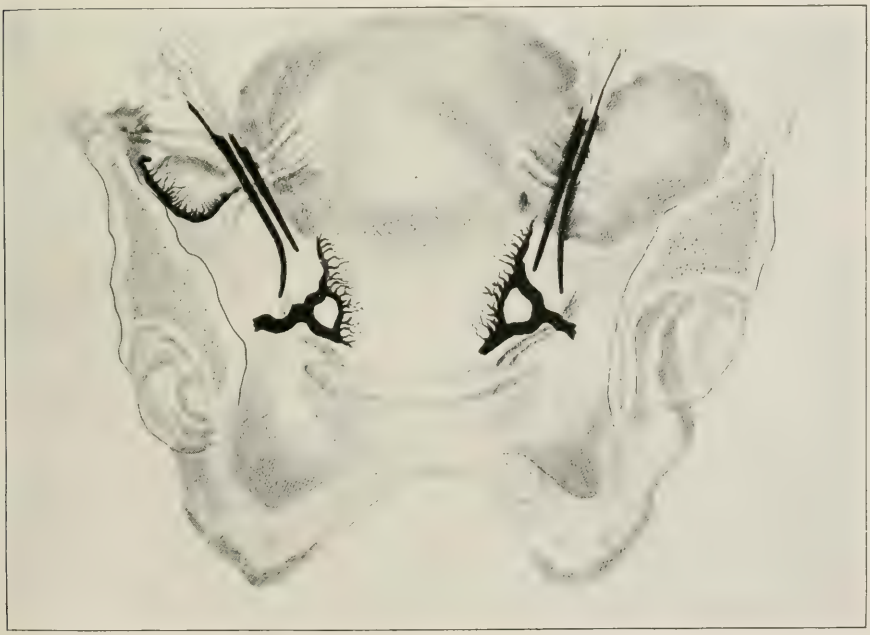


FIG. 6. (Schematic.) Illustrates the temporary application of forceps to the broad ligaments preliminary to the removal of multiple fibroma by bisection of the uterus.

When this step of the operation has been completed excellent facilities will be afforded for the careful examination of the rectum and for the repair of intestinal injuries. It will be found that practically every case of suture of the pelvic peritoneum may be so arranged as to completely cover any denuded surface and absolutely control all pelvic oozing. For a long time in these cases before I began to employ this operation I felt compelled to drain a very considerable portion of the cases on account of the pelvic oozing, and also because of the fear of hidden pelvic injuries to the rectum, which might subsequently lead to peritonitis. To make myself more closely understood I take the privilege of demonstrating this series of specimens to you, the first five of which represent a number of fibroids which are particularly amenable to this method of operation, and the latter group of cases representing the types of pelvic inflammatory disease, which, in my opinion, should be operated upon by this plan.

Finally, I think I may safely say that in my hands in a very considerable group of cases this operation has presented so distinctive advantages over all other plans employed, with a very low degree of mortality following the operation and a far more satisfactory termination of the case, that it seems to me it presents one of the most distinctive features made in the technical attack upon new-growths of the uterus and chronic inflammatory diseases.

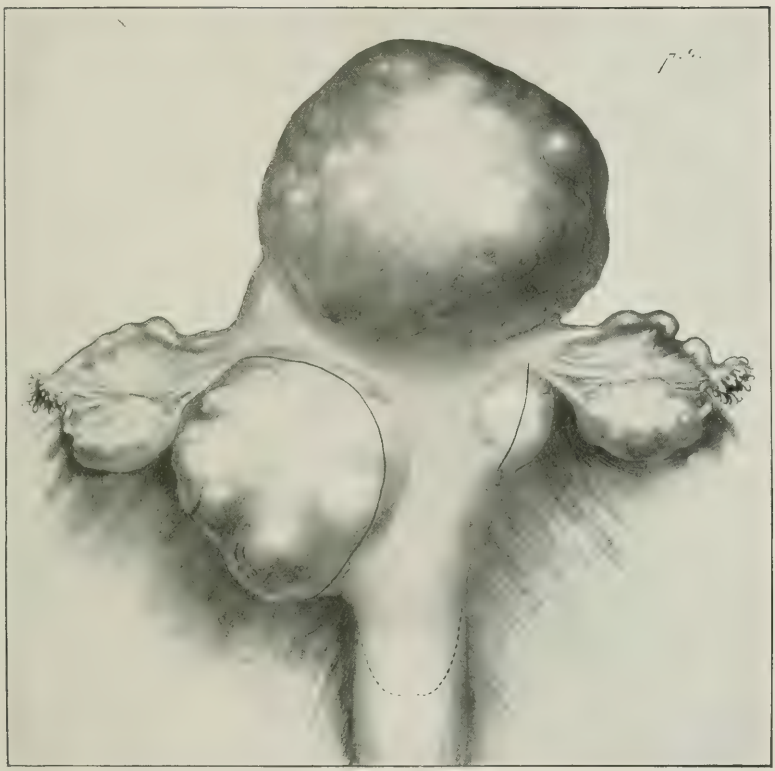
MYOMECTOMY vs. HYSTERECTOMY.

By ANDREW J. McCOSH, M.D.,
NEW YORK.

During the past ten or twelve years the surgical treatment of the pelvic organs of the female has happily become more preservative, or perhaps one might term it less destructive. Previous to this time it was the theory of most gynecologists, and on this their practice was based, that if either the tube or ovary were diseased both should be removed. Many operators went a step further, and argued that if the tubes and ovaries were diseased it was best to remove all the pelvic organs. It is needless to quote from the text-books and journals of those days extracts indicating the necessity for the complete removal of ovaries and tubes, and even of the uterus, in cases in which to-day such an operation would be considered by many of us unjustifiable. While it unfortunately cannot be said that this change of view concerning the judicious preservation of the pelvic organs has been universally adopted, the general tendency is in this direction. The uterus with its adnexa is now but seldom removed where a less radical operation on ovaries and tubes will suffice to effect a cure. Cystic ovaries are not commonly, as heretofore, removed *in toto*, or at least the Fallopian tubes are saved in whole or in part. Every effort should be made by the modern surgeon to preserve sufficient of a woman's pelvic organs to at least prevent a sudden and premature menopause, even if it be not possible to leave the woman in a condition in which she will be capable of bearing children.

In cases of fibromyomata of the uterus less progress seems to have been made in the direction of preservation of organs

FIG. 1.



CASE 1. Who later became pregnant. Showing also incisions for removal of fibroids.

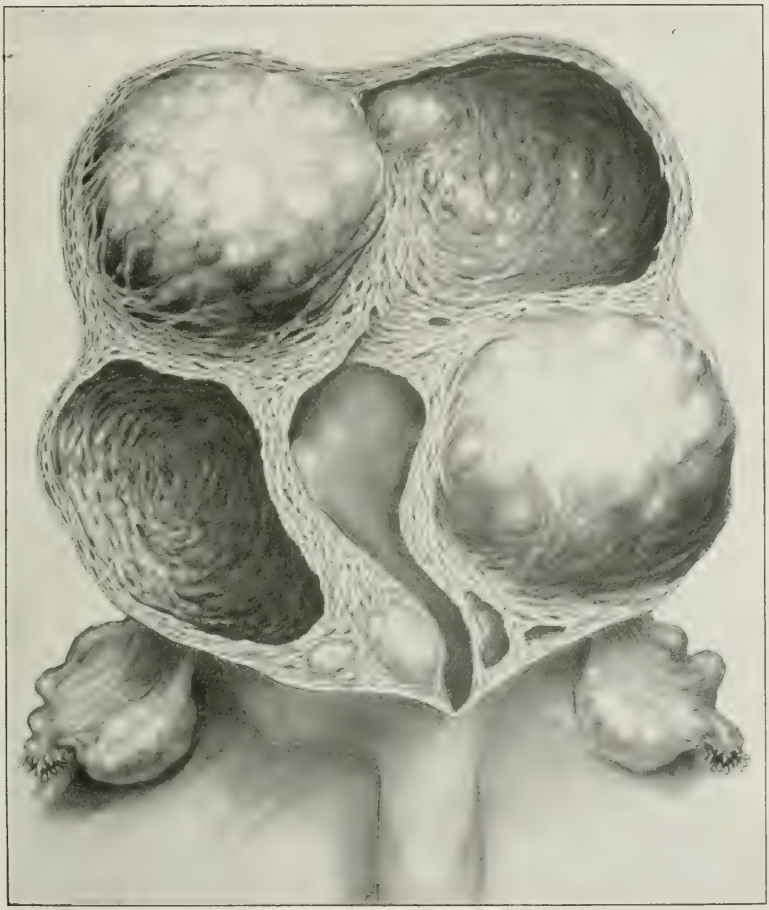
than perhaps is the case in any other line of surgery. It is true that within the past few years attempts have been made by a few abdominal surgeons to be less sacrificial in their treatment of these cases, but the majority of operators still consider that a uterus which is the seat of injurious fibroid tumors is one which demands removal. I am not now referring to debatable cases, in which the tumors are small or cause but few symptoms, but to grave cases in which a woman's life or happiness is threatened by excessive hemorrhage or pain. From conversation with surgeons and from perusal of the proceedings of gynecological societies, one cannot but be impressed with the fact that in such cases the rule of most operators seems to be extirpation. It is true that an article is occasionally read in which are reports of a few cases of myomectomy, but generally these are the exceptional cases, and to one article on this subject there will be read a dozen dealing with some minor detail in the operation of hysterectomy. The conclusion must naturally be drawn that in the practice of most surgeons myomectomy is but rarely done, its proportion to hysterectomy being about one in ten or even one in twenty. It is also true, however, that there is considerable difference of opinion, and consequently of practice, in regard to this question, as well as in regard to the question of any radical operation for uterine fibroids.

My own practice tends, I think, toward conservatism. Unless the fibroid is threatening a woman's life, or is rendering her a semi-invalid, I have been inclined not to advise radical operation ; at least such was my practice when I felt that the uterus must be sacrificed. Since, however, I have learned that in the great majority of such cases the uterus need not be removed, I am less loath to advise operation, especially in younger women. Even in such patients, however, I do not advise operative interference unless there be menorrhagia, pain, or rapid growth of the tumor. In older women, unless the symptoms be more severe, I generally advise delay, in hopes that the menopause may bring relief, or a preliminary curettage is suggested. As a general surgeon I am not usually consulted about mild cases

of pelvic tumors. In my private practice the patients are generally referred to me because of symptoms which demand relief by means of operation. In my service at a large general hospital the poorer classes generally apply only after failure of medical treatment, when they are much exhausted by pain or hemorrhage, or when the size of the abdomen drives them to seek operative relief. I mention this so that it may not be said that the cases which I encounter are mild ones, perhaps not in need of operation.

It has always seemed to me that the surgeon's advice to a woman with a uterine fibroid should be more or less influenced by what the operation shall accomplish for that woman. To the average young woman, it is a matter of grave importance to submit to an operation which will deprive her of her sexual organs. If there be a reasonable chance that her tumor can be removed without the loss of her uterus, ovaries, and tubes she will be much more apt to accept operative relief, and the surgeon will be much more justified in recommending such treatment than would be the case were the removal of these organs necessary. Apart from the dangers of operation, the removal of what a woman considers her womanhood is always to her a serious consideration, and fear of this will often doom her to a life of semi-invalidism. If she can be assured that the probabilities are great that the tumor can be removed and her organs saved, she and her family will be much more willing to agree to submit to an operation. For example, let us consider the young unmarried woman ; no one will deny that the removal of her uterus with her ovaries is a calamity. The artificial menopause that appears in advance of its proper time often produces months or years of physical and mental discomfort. Brooding over her loss, and depression of spirits, perhaps concealed from her family, are not unnaturally produced by the knowledge that she is in a measure unsexed. She is apt to shun the intimate society of men, for she feels that she cannot, probably, marry the man of her choice. If marriage seems imminent she must face the ordeal of telling her lover that she is no longer a perfect woman, and for her, child-

FIG. 2.



CASE 13. Showing uterus split open through anterior wall.

bearing is impossible. Take, on the other hand, a married woman under forty, what a blow must the loss of her sexual organs be to her and her husband; and even if a certain estrangement be not the result, she is apt to be in constant dread that she may lose some of his affection. On the other hand, however, it is argued that she is saved from a life of suffering, but the price for such relief is great, if it be not absolutely necessary. In the case of elderly women the situation is, of course, quite different. The removal of the uterus does not in them result in a premature menopause, and in women well past forty years of age a hysterectomy is generally to be preferred to a myomectomy.

In my own practice myomectomy is becoming more and more frequent and hysterectomy correspondingly less frequent. I cannot see why the uterus should be totally removed simply because within its structure are located one or more tumors benign in character. Why should we make the uterus an exception? Would we consider it good surgery to amputate an arm simply because in its muscles are located one or more fibromyomata? Or because a cataract appeared in the eye would we think of enucleating the organ? Most certainly not, but on the contrary we would make every effort to save the limb or the organ, and, in order to do as little damage as possible, we often resort to the most elaborate plastic operations. It seems to me that we should employ similar patience and skill to save the uterus. Very often this can be done if we only dismiss the impression, which years of reading and practice have made upon our minds, that given a uterus with fibroids demanding removal, *ergo* hysterectomy. Instead of adopting this narrow view we should consider it of the greatest importance that the uterus of a young woman should be saved, and in striving for this end we should employ all our skill in mapping out a plan of procedure which will obviate the sacrifice of such an important organ. If we adopt this view, I feel sure that in the future thousands of women will preserve an organ which in the past has so often been sacrificed. I feel sure that I am not exaggerating this point. In my practice

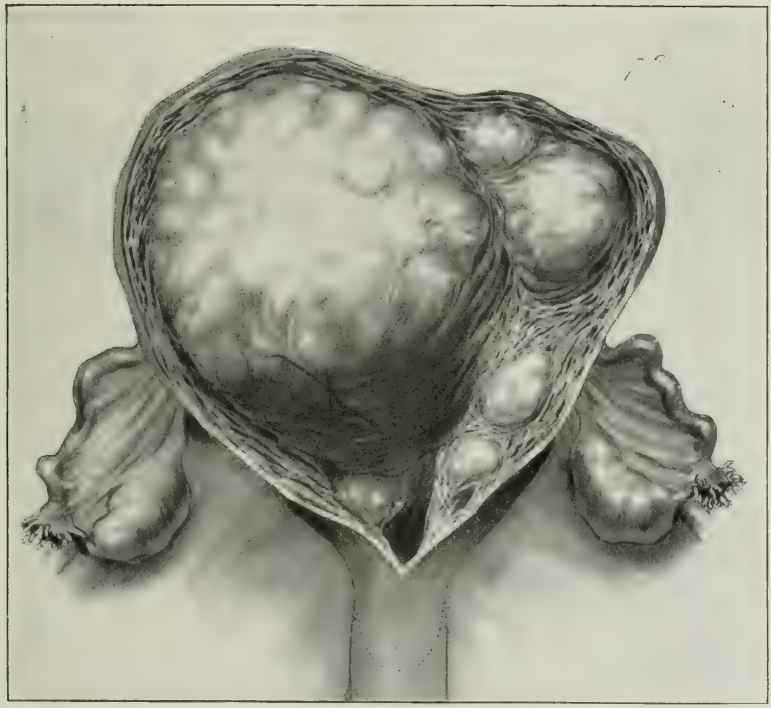
six years ago myomectomy bore toward hysterectomy the ratio of 1 : 23; in 1900 the ratio of 5 : 27, and in the past year the ratio of 22 : 17. It is now my custom to treat the uterus just as I would treat any other organ, for example the stomach or kidney. If it be the seat of malignant disease, I make as complete an extirpation as possible. If it be the seat of benign tumors, I remove the tumor or tumors, striving to injure as little as possible the organ itself.

Methods of Operation. For the removal of uterine fibroids the vaginal route offers, in a certain number of cases, a suitable approach. If the tumors are subserous, moderately small, and not very numerous, the uterine body can be without much difficulty turned into the vagina through an incision, anterior or posterior to the cervix, and the tumors extirpated. The application of this method is, however, limited. Following vaginal celiotomy there probably is less shock, and the period of convalescence is shorter. The scar is invisible, and the dangers of a resulting hernia are practically avoided, but at the present day the risk of such a complication following a clean abdominal incision should be almost *nil*. This method, however, is apt to be attended by the distinct disadvantage that less opportunity is offered for the thorough inspection of the pelvic organs, and less facility for the judicious selection of parts requiring removal either partial or complete.

Apart from the difference in the incisions, the technique of myomectomy by the vaginal route is similar to that by the abdominal route, and it is with the latter class of operations that this article especially deals.

An abdominal incision through which the uterus and its tumors can be thoroughly explored and delivered is made usually in the median line. Through this the uterus is drawn out by the hands, volsellum forceps, or Thomas cork-screw. The intestines are carefully walled off from the pelvis by pads of gauze, the patient being in the Trendelenburg position. In elderly women the uterus with its tumors is then removed, the cervix being generally left attached to the vagina; in younger women a careful examination is made to determine whether it

FIG. 3.



CASE 7. Showing uterus split open through anterior wall.

is possible to remove all the fibroid tumors, and yet leave sufficient uterine tissue to form a useful organ. I am not much influenced by the location of the tumors as regards their relation to the uterine canal. Of course, if the tumors are pedunculated or subserous, the operation is comparatively simple; but the mere fact that the tumor is interstitial or submucous influences me but little in deciding whether the operation shall be a myomectomy or a hysterectomy. The size and number of the tumors are also more or less disregarded. There are of course certain cases in which myomectomy is either impossible or too dangerous; these are apt to be cases in which the uterus from the cervix to the fundus is infiltrated with scores of small fibroids, perhaps extending into the broad ligaments. There are also of course cases in which the tumors are of very large size, and in which hysterectomy must be the operation of choice. As will be seen, however, from the report of some of my cases, tumors weighing six, eight, and ten pounds have been removed, and frequently their number has exceeded twenty.

Myomectomy having been selected as the operation to be performed, or at least attempted, an effort is made from the appearance of the mass to determine the position as nearly as possible of the normal uterine tissue. Inspection combined with careful palpation will often enable the operator to locate the tumors. The position and attachments of the adnexa are often landmarks of importance, though these are sometimes so distorted and twisted that they may be misleading. The recognition of the relation which the tumors bear to the uterus, while of advantage, is not of essential importance, as frequently the entire mass must be split open from the fundus down to near the internal os. The recognition will, however, enable the operator to spare unnecessary section of the uterine muscle, and will aid him in determing in which direction the incision is to be made. If the tumor or tumors be pedunculated or subserous without encroachment on the uterine canal, their exact relationship is easily determined, and their removal is simple. If the tumor be pedunculated, an incision is made around the

base of the pedicle, and the edges of the wound approximated by one or two layers of catgut sutures.

The method of procedure in the enucleation of sessile tumors will depend somewhat on their size and number. If their number be small and if they be well isolated from each other, a separate incision is made through the uterine tissue directly down on the tumor. It matters not whether it be subserous, interstitial, or submucous. If the tumor be small, it is grasped with volsellum forceps and forcibly torn out of its bed. If it be large, it is rapidly enucleated with the fingers, considerable force being employed in order to accomplish its rapid removal. With the exception, perhaps, of pressure by the assistant's fingers on the edges of the cut muscle overlying the tumor, no attempt is made to prevent hemorrhage until the tumor has been removed. If this has been forcibly and rapidly done the hemorrhage is very slight, and in a few seconds the vessels generally contract and all bleeding ceases. Occasionally a hæmostatic clamp is applied, but usually this is unnecessary. The remaining tumors are then attacked and removed in the same manner. All tumors are generally enucleated before any of the cavities left by their removal are sutured. The object of postponing their closure is to allow of further contraction of the uterus, which generally begins at once and continues for some time.

The method of closure of cavities from which tumors have been enucleated will of course depend upon their size and depth. It is wise to pass the sutures well down to the bottom of the wound, and often several rows will be required. The deepest layer, which passes down to the floor of the cavity, includes one-half to one inch of each wall. If the remaining depth be one-half inch or less, a second layer which includes the serous coat will suffice. If more than one-half inch remains it will be well to employ three rows. (Fig. 4.) The suture I prefer is a continuous one of moderately fine catgut (No. 2). The sutures should be tightly drawn, as otherwise in a few minutes, owing to the contraction of the uterus, they will be found to be loose, and slight bleeding may result. If the tumor

be large it is better not to incise the tissue overlying the centre of the tumor, as if this be done there will be left two useless, redundant flaps, which have later to be curtailed. For this reason, time will generally be saved if the greater part of the overlying uterine tissue (capsule) is removed with the tumor by means of a circular incision around what appears to be the line of junction of the tumor with the uterus. (Fig. 1.) Very often after enucleation of the tumors it will be found that the uterine canal has been more or less opened. Under such circumstances, after curettement of the entire endometrium by the insertion of a sharp spoon or curette through the opening in its wall, its edges are closed by a continuous catgut suture, which, in addition to the mucous membrane, approximates about one-third of an inch of adjacent uterine tissue. As a rule, I have included the lining membrane of the uterine canal in the suture and have not found that any bad result has followed. Cultures from the interior of the uterus are almost invariably sterile. We have found that in only one out of twenty-three cases did any growth develop, and this was not pyogenic, and may have been due to accidental contamination. In one other of my cases, in which a fœtus more or less macerated was found in the uterus, a growth developed. Of course if the interior of the uterus suggest infection, it would be well not to include the lining membrane in the suture, and in such a case it is also well after dilatation of the cervix to insert a small strip of gauze or rubber tissue, which passes downward into the vagina.

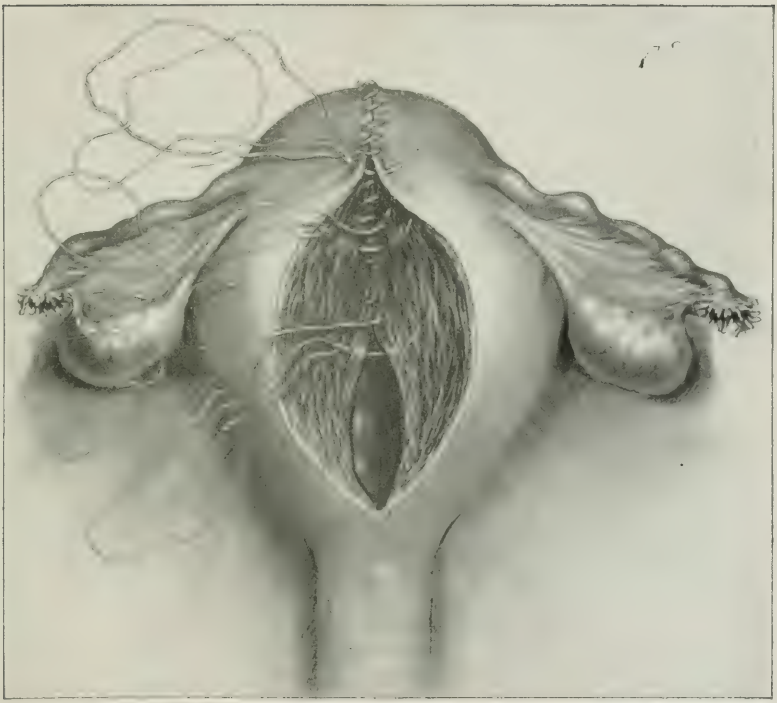
If tumors be multiple and more or less distributed throughout the uterus, there must be a different plan of procedure; the uterus must be more or less split open from the fundus downward on either its anterior or posterior surface, or it may be necessary to completely divide it into halves as far downward as the inner os, each half remaining attached to its broad ligament. In either case the interior of the uterus is freely exposed to view. This free exposure is sometimes deliberately planned, at other times it is merely the result of enucleation of one or more tumors which had encroached on the canal. With the uterus thus laid open every part can be readily palpated,

and tumors of very small size can be easily felt. Careful search is made by palpation of the uterine wall between the finger and thumb, and all tumors, no matter how minute, are removed by section through the overlying muscular tissue, either from the exterior or the interior. If there be but a suspicious hardness, it is better to cut into it and ascertain if there be not a commencing fibroid temor. Interstitial tumors are but seldom single, and usually from five to twenty tumors are found and removed. As many as thirty-six were removed from one uterus, and yet a very presentable organ was left.

The appearance of the uterus which remains after enucleation of the various tumors is often very ragged and unpromising. The cut and torn edges must now be trimmed and pared in order to secure wound surfaces as smooth and as regular as possible. Tags and shreds of tissue must be freely cut off, as owing to the muscular hypertrophy of the uterine wall there is generally left a full abundance of tissue from which to mould a uterus of more than normal size. The endeavor should be to restore the organ to as near its normal size as is possible, and one should not fear to trim freely and sacrifice as much of the tissue as will secure even surfaces and exact approximation.

The treatment should be very much the same as we would adopt were a tumor removed from the belly of any large muscle, except that in the case of the uterus the procedure is more simple on account of the firm consistency of the muscular structure. An endeavor is always made to preserve those portions of the uterus to which the broad ligaments and adnexa are attached and also as much as possible of the uterine canal with its lining of mucosa, though occasionally the upper part of this must be removed, and at times little of it above the internal os remains, and to form the new uterine body there may be but thin flaps of muscle attached on each side to the broad ligaments and adnexa. When I first began to do myomectomies, especially when the uterus was more or less completely divided into two halves, I was often worried by the unshapely appearance of the organ which I was trying to save; but I soon learned that the uterus after careful trimming of its redundant

FIG. 4.



CASE 7. Showing suture of uterus after removal of fibroids.

tissue and subsequent careful suture continued to contract and assume a more and more normal shape and size up to the very close of the operation; and the examination of such uteri months and years later has convinced me that nature continued to mould these organs into shapes that were not far from normal.

The question of hemorrhage practically never troubles me. At the beginning of my experience with these operations I often passed an elastic ligature, to be tied in case of need, around the lower part of the uterus. I soon found, however, that this was never needed, and of late never think of even asking to have one among my instruments. At first, also, my assistants were inclined to grasp the broad ligaments in their fingers to prevent hemorrhage, but I long since learned that this also was entirely unnecessary. I now employ but little hæmostasis. Usually the uterus can be freely cut or split open, with but little loss of blood, and in a few seconds practically all bleeding ceases. At times a few artery clamps are applied to spurting vessels, and occasionally the cut edges or flaps must be compressed with the fingers for a half minute or so. When the incisions are made close to the attachments of the broad ligaments one or two vessels of considerable size may need attention. Even if hæmostatic forceps must be applied, they can be safely removed without ligation of the vessels at the end of a few minutes. Two of my operations have been on pregnant uteri, and even in these two cases the bleeding could not be called serious or even troublesome. Freedom from hemorrhage depends more or less on rapidity of enucleation of the tumors. If care be taken to secure every bleeding vessel, much blood will be lost, and the corresponding shock will be considerable; but I feel sure that if fear of hemorrhage is entirely cast aside and bold incisions, with forcible and rapid enucleation, be practised the loss of blood will be slight.

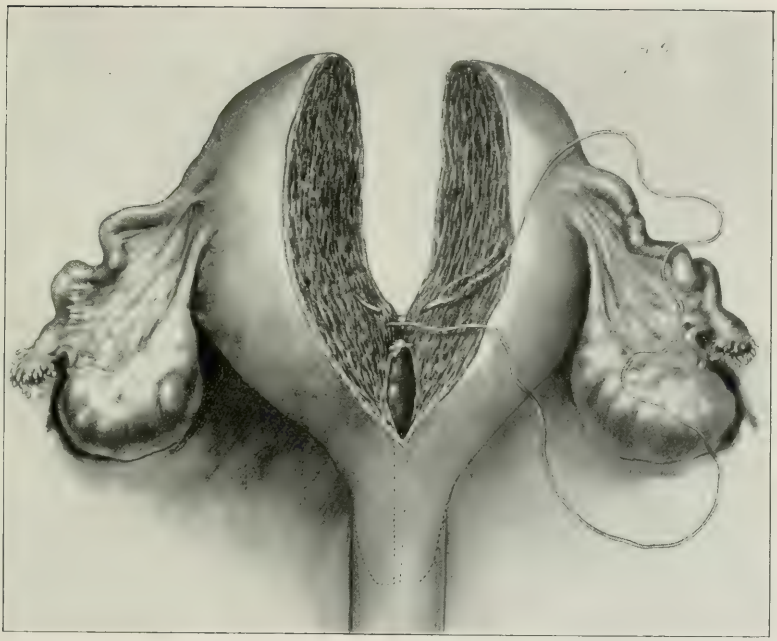
For the reconstruction of a uterine body from what appears to be a mass of more or less unsymmetrical muscle, several rows of continuous catgut sutures are employed. The cut and torn edges of the endometrium are first united together with some of the adjacent muscular tissue, and the succeeding rows

are employed exactly as has been described for the closure of a cavity out of which a tumor has been enucleated. (Fig. 5.) As a rule the broad ligaments have not been disturbed, though occasionally a tumor must be shelled out from between their layers. This, however, is generally accomplished from the uterine extremity, and the cavity thus made is closed by the reconstruction of the uterus itself. Should, however, either layer have been split for removal of a tumor, it is carefully closed by suture; indeed, every effort is made to leave absolutely no surface uncovered by peritoneum. In some cases in which there has been extensive laceration of the sides of the uterine canal, or in which there may be a tendency to oozing of blood, a narrow strip of rubber tissue or even gauze is passed down through the cervix into the vagina, its upper end resting in the uterine canal. This is removed in about thirty-six hours. Before the abdomen is closed the patient is lowered from the Trendelenburg position in order that one may be sure that there is no bleeding. Occasionally an additional suture is needed. It is often gratifying, when the uterus has been dropped into the pelvis, to observe what a well-contracted and comparatively shapely organ has been constructed out of what fifteen minutes previously had appeared to be a more or less ungainly mass of ill-treated uterine tissue.

The dangers of myomectomy are certainly as great as are those of hysterectomy. With the exception of the complications apt to attend or follow an hour's anæsthesia, there are three sources of danger: hemorrhage, shock, and sepsis. As regards the first, I have never in forty-seven cases seen a loss of blood which could be considered even as severe, and certainly never serious.

Shock is generally very moderate, though in perhaps 10 per cent. of my cases it has been severe, but has never ended fatally. Sepsis in a slight degree may have been present in a certain number of the cases, or rather some form of sapremia may have caused an elevation of temperature of two or three degrees, which in a few cases has persisted for several days following the operation. In none of my cases has it ended fatally, and in none

FIG. 5.



Uterus divided as far as internal os. Commencement of suture after trimming of uterine walls.

has it resulted in any pus. I have noticed, however, that following myomectomy there is for four, five, or six days a range of temperature certainly one degree higher than that following hysterectomy. As regards the accidents which may follow any severe operation, pneumonia has appeared in five of my cases, in two ending fatally, though in one of these there was a complication of fatty liver and nephritis. These two cases constituted my only fatal ones. In this respect my experience after hysterectomy has been very similar, and it always seemed to me that pneumonia follows more frequently operations for uterine fibroids than it does almost any other class of operations, with the exception of course of those done on the air passages.

In considering the advantages of myomectomy over hysterectomy, one naturally asks for the ultimate results. I have been able to follow thirty-two patients. The results are as follows:

1. *Menstruation.* Without exception menstruation has appeared with regularity. In twenty-seven cases it may be termed normal, varying from two to seven days. In three cases it has been somewhat excessive, but in one of these after a curetting done fifteen months after the myomectomy it became natural. In two cases considerable pain is complained of during the first two days.

2. *Pain.* With one exception all cases are practically free from pain. The one patient who still complains is a nervous woman and is one of those who have painful menstruation.

3. *Pregnancy.* Of the thirty-two patients twenty-one are married women. Three of these have for the first time become pregnant, two having been delivered of live children at term, the other being five months pregnant.

4. *Recurrence of Tumors.* I have been unable as yet to learn of any recurrence. In this respect the uterus does not differ from other organs. By some surgeons the possibility of recurrence of the tumors is used as an argument against myomectomy, but the same objections are valid against operations for the removal of any other new-growth or foreign body.

Brief histories of the cases in which pregnancy occurred are as follows:

Case I.—L. B., aged thirty years, married. Never pregnant. For eight years had suffered from severe menorrhagia and considerable pain. Twice curetted without much benefit. Myomectomy January 26, 1899. Seven tumors removed, five subperitoneal, two interstitial or submucous (Fig. 1); weight of largest, six pounds. In February, 1901, became pregnant. Normal confinement in November, 1901. Health excellent.

Case II.—R. G., aged thirty-eight years, married. Never pregnant. For seven years menorrhagia, severe pain due to local peritonitis. Myomectomy October 26, 1899. Three interstitial fibroids removed, largest 6 x 4 x 4 inches; total weight, eight pounds. Pregnant October, 1900. Normal confinement June, 1901. Health good.

Case III.—M. M., aged thirty-four years, married. Never pregnant. For five years severe menorrhagia and considerable pain. Myomectomy March 12, 1901. One large interstitial fibroid removed; weight, five pounds; uterus was completely divided, gauze drain through the cervix. Became pregnant January, 1902.

In conclusion I would offer the following:

1. In young women with uterine fibroids demanding removal myomectomy should always be the operation of choice.

2. Myomectomy is possible and advisable in the great majority of cases of fibroid tumors in young women.

3. For the safe performance of myomectomy the strictest asepsis is needed, otherwise it becomes a most dangerous operation.

4. In the operation of myomectomy fear of hemorrhage should be cast aside and bold and rapid methods should be adopted.

5. The operation is attended by the same danger to life as is hysterectomy.

6. The ultimate results as regards menstruation, pain, and pregnancy are satisfactory.

THE CHOICE BETWEEN THE SUPRAPUBIC AND THE INFRAPUBIC METHODS OF REACHING TUMORS AND OTHER SURGICAL LESIONS OF THE PELVIC ORGANS.

By MAURICE H. RICHARDSON, M.D.,
BOSTON.

The rules for guidance may be summed up as those dependent upon considerations of theory and those dependent upon considerations of experience.

The subject may best be discussed from four points of view: The point of view of pathology, that of anatomy, that of feasibility, and that of experience.

1. Considered from the pathological point of view, certain lesions demand the suprapubic incision because the exact nature and extent of the lesion can be determined only by a full and clear view, and by a thorough palpation. Moreover, the proper treatment can be selected and applied only when opportunities for observation and for dissection are unobstructed. For example, in cancer of the uterus, in lesions of the pelvis of doubtful nature and extent, in hemorrhages and in infections, in a word, in any but the simplest questions of uterine extirpation and pelvic drainage, the nature of the lesion requires the suprapubic cut.

2. The point of view of feasibility. From this point of view is discussed the question of facility in applying surgical remedies. It is clear that we should attack from above tumors too large for delivery by the vagina; tumors of appropriate size which are evidently adherent and immovable; tumors high up in the pelvis; and lesions which cannot easily be brought within reach from below.

Tumors of the cervix or close to the cervix may be approached from below if the lesion is not infiltrating and if enucleation proves easy. All dissections close to the ureters, in neoplasms and in inflammations, no matter how accessible these lesions may be, should be made by the suprapubic route.

A small movable uterus and a capacious vagina indicate, from the point of view of feasibility alone, the vaginal route for hysterectomy.

Feasibility must be indeed great to justify the vaginal route for the removal of any pelvic tumor.

Pelvic drainage, from this point of view, is not to be encouraged unless pus is pointing in the vagina. It is only commonsense to select dependent drainage in such cases, especially if the patient's general condition is not good, though from the point of view of experience, vaginal drainage is often so unsatisfactory as later to require radical suprapubic operation.

Vaginal drainage is never justifiable unless the fluids are just beneath the vaginal mucous membrane.

3. From the point of view of anatomy, the suprapubic route should be the invariable route, because it is the route of unobstructed view and of intelligent dissection. It is the route by which the fewest blunders will be made, and the route by which these blunders can be most quickly and effectually remedied. In a word, it is the route of anatomical precision.

The vaginal route is, from the anatomical point of view, one of darkness and possible disaster. But one operation is, in my opinion, justified by the vaginal route considered from this point of view—that of hysterectomy for lesions which permit dissection in closest proximity to the cervix.

4. The point of view of experience. Since January 1st the proportion of my abdominal operations to vaginal has been some 250 to 6.

My experience with pelvic surgery has gradually led me to choose almost exclusively the suprapubic route. In exceptional cases, however, I am very strongly in favor of the vaginal. These exceptions are (1) uterine lesions which require hysterectomy without dissections into the pericervical tissues; for

example, malignant disease of the uterine body or of the cervix, when I am satisfied by bimanual palpation that there is no infiltration of the broad ligaments and no involvement of the lymph nodes; (2) hemorrhages from the non-enlarged uterus threatening life; (3) collections of pus pointing in the vagina. I have had but one death after vaginal hysterectomy. The number of vaginal hysterectomies is, however, small—probably not over fifty. In suitable cases vaginal hysterectomy is in my opinion and experience one of the most beautiful operations in surgery. Accidents have been few and of little moment. The shock has been slight, recovery rapid, and ultimate results, especially in cancer of the uterine body, encouraging.

The vaginal route is more favorable and should be more frequently employed when it is considered from the point of view of actual experience than when considered from any other point of view. When the selection of this route is not incompatible with the arguments based upon pathology, upon anatomy, and upon feasibility, in my opinion experience justifies it.

On the whole, the suprapubic route is, in the great majority of cases, the route of choice; the infrapubic, the route of exceptional cases. Some of these exceptions are based upon pathology, some upon anatomy, some upon feasibility, and some upon the broad ground of actual experience. Each operator must learn for himself. Limited to suitable cases, the infrapubic route is one of the most satisfactory methods of attack. It is rapid, safe, and efficacious.

THE ABDOMINAL ROUTE FOR APPROACHING RECTAL TUMORS.

By ROBERT ABBE, M.D.,
NEW YORK CITY.

It would simplify surgical work beyond the fondest hopes of the operator if exact lines of action could be defined for unifying methods of treating disease. But the more exact the study of each subject becomes, the more the operator finds that he may wisely choose between a variety of good methods, adapting one to the particular case in consideration.

With much discrimination he must approach the question of the best method of removal of cancer of the rectum.

Apart from the operative technique, the subject involves principles such, for instance, as the advisability of lessening the local irritation of the disease precinct by diverting the channel of intestinal discharge to the groin; also, of diminishing the vascularity of the pelvic viscera by ligation, in the hopes of retarding recurrence; and, third, of the now accepted principle of the very widest possible removal of cancerous growths.

The main question as to the relative value of the abdominal route in the removal of the rectal tumors requires a reminder that the word rectum involves not the part only within reach of the digital examination per anum, but that portion lying in the hollow of the sacrum, which we are all familiar with, so beautifully displayed from within the abdomen when we place a patient in the Trendelenburg position and see it almost wholly free and covered by peritoneum in its upper part near the synchondrosis, but with less covering as it descends in the hollow of the sacrum until, at the bottom of the cul-de-sac, it disap-

pears into the cellular space below. At this point there remains three and a half to four inches out of sight between between peritoneum and anus.

It is the consideration of tumors of malignant nature in any portion of this tube that we are to discuss.

By far the larger portion of such tumors are found near the anus—that is, roughly speaking, two-thirds do not involve the mucous membrane higher up than the peritoneal limit in their early growth, and of these there would be no difference of opinion the world over as to the wisdom of removing those which are found low down near the anal margin by the perineal route.

It is those tumors which reach the limit of the peritoneum, or those which involve the rectum entirely above the lower cul-de-sac, that will admit of choice of method, and to remove which it has grown to be my conviction that one can best operate by the abdominal or the combined abdominal and perineal or sacral route.

The results of operation on these cases so depend on other than mechanical means employed that statistics are of much less value to us as surgeons than the technical considerations.

In this matter I shall assume that we all have in mind that when cancer of the rectum is reported as cured by any method it may be less the method than the fact that there was a big tumor all tuberous and nodular on the mucous coat, which would represent a comparatively simple affair, or a small infiltrating disseminated mass of the deeper wall permeating the bladder or prostate, or attached to the sacrum. Therefore, I shall for the moment discard statistics and appeal to principles well recognized by operators of experience.

What we all desire is a method of dealing with grave internal and high rectal growths, with fullest assurance of safety to the patient and best feeling of eradication, if such be possible. It has been my fortune to operate on many such by various methods, and to have had a growing dread of the perineal route, except for the lowest tumors near the anus, until Kraske's method gave such enormous advantages of accessibility and relative bloodlessness.

In many of those, however, operated on by this method I was impressed by the difficulty in starting the dissection by liberating the rectum from the sacral hollow after the lower bone segments were removed. It often grows fixed and fast, and its removal in the face of hemorrhage often gives a very "mussy" operation (if I may so speak) in spite of one's desire to make it clinically attractive.

I was also impressed by the fact that the oblique cutting upward in the pelvis with scissors necessarily makes more hemorrhage and more jagged cuts than is desirable, and that above all, notwithstanding one's best intention, there is universally a tendency to cut off the healthy bowel nearer the disease limit than is safe. This is doubly invited by one's desire to get enough bowel to bring down to meet the anal margin, and by the fact that traction on the tumor stretches the healthy bowel, so that when cut off apparently an inch above the disease the specimen shows only a quarter inch of mucous membrane uninvolved. In the Kraske method one has to handle the cut end of the rectum in the grasp of forceps after removing the tumor, and considerable soiling of the wound is inevitable.

I am sure we have all had the same experience that the rectum above the peritoneal pouch will not always pull down as we wish it would, and we are tempted to cut up behind to liberate it, and usually cut more hemorrhoidal vessels than is good for the vitality of the bowel when additional traction is made on it.

No one will deny that when we have carefully explored the rectal feeling of the tumors we still have no knowledge of the intraperitoneal appearance of the possible invasion of the peritoneal aspect of the tumor nor of the location of the sacral lymphatics involved, nor can these be adequately appreciated until we have felt and seen them from above.

From my experience thus far in several cases of rectal tumors operated upon from above I am impressed with the wisdom of advocating the method of Quenu, of Paris, though I have not yet gone so far as to ligate both internal iliacs preliminary to removal.

When the patient is in high Trendelenburg position and the intestines are well out of the pelvis, the manipulation of the rectum is comparatively easy.

This will be much enhanced if a liberal median incision in the abdomen has been made and retraction is well maintained. I have twice found a rectal obliterating circinoma which, after excision from above, allowed union of the ends by Murphy's button in one case and by suture in another with perfect results. In the latter the rectum was resected by cutting the peritoneum down either side of it in the sacral hollow and across it below in the cul-de-sac, thus creating an easy cellular tissue pedicle for ligation. The lower cut end was far too much buried for a button anastomosis, but, following Maunsell's idea, four heavy silk stitches united the two ends, and were brought out of the anus by traction on their long ends, so as to invaginate the upper into the lower, where a few peritoneal sutures held it. A pelvic drainage-tube was left for security, and the result was admirable.

One experience with an extensive growth of cancer of the lower rectum involving the base of the bladder and including prostate and vesiculæ seminales, in which I approached it by the abdominal route, emphasizes some of the advantages to such an extent that I will speak of points that are illustrative.

The abdominal exposure being perfectly satisfactory as to position, light, retraction, etc., it is seen that several good-sized lymphatic glands appear in the sacral hollow well above the growth. The upper margin of the hard tumor comes just above the peritoneal cul-de-sac. It is evident that if I excise the lower part only I will leave some diseased lymphatics. Therefore, I choose the upper part of the rectum near the brim of the pelvis and pass two purse-string sutures of quite heavy black silk around it, piercing with the needle all coats of the bowel and tighten these separately after cutting the bowel across, so as to invert each end by the purse-string.

Then on cleansing these inverted stumps I have a perfectly clean pelvis in which to commence resection of the lower portion. Picking up the peritoneum at the side of the rectum above, a curved blunt scissors quickly and bloodlessly cuts the

peritoneum down along each side of the rectum and across in front of it. The pelvic peritoneum being loosely attached, I can now readily strip out the rectum and its vessels and lymphatics by finger dissection partly, and thus create an easy pedicle for ligation of the middle hemorrhoidal artery and vessels. This proceeds with little loss of blood until I reach down to near the coccyx. I regard the ligation of vessels from above as an important aid. At this juncture the dissection from the under surface of the bladder seems more difficult than it would be from the perineal route, though one is pleased to see how readily one peels it down from the sacrum. I then pack gauze in the pelvis, place the patient in lithotomy position on a high cushion, and finish the enucleation from below.

The inverted stumps of the bowel certainly give much comfort in operating in a clean pelvis. The purse-string stitch is the quickest method possible for closing a cut bowel end, and is one I have used in lateral anastomosis mostly, but shall always adopt it in this method for the rectum.

The question of disposing of the upper stump is one that may well appeal for solution. Whether to put it on a severe stretch and attempt to bring it into a perineal or sacral wound, or to make at once a lateral inguinal colostomy, is a question. My own argument is for the latter for the following reasons:

1. In the combined method it settles at once all uncertainty and delay by having it brought out of an inguinal cut before the patient leaves the Trendelenburg position, thus leaving the operator free to confine his whole thought to most thorough enucleation of the cancerous rectum.

2. It removes the anal discharges forever from the pelvis, and thus takes away one source of renewed irritation of any remaining cells of disease.

3. If the base of the bladder proves to be involved in the completed operation and a possible leakage occurs, the dangers of mixed urinary and fecal contamination are obviated.

4. The results of newly established artificial ani in perineum or sacrum are such that continence of flatus and feces cannot usually be hoped for, even to as great an extent as in an inguinal

colostomy; therefore, inasmuch as a T-bandage or napkin will usually have to be worn, the inguinal has no disadvantage.

5. When, then, the operator begins with the idea of turning the sigmoid colon end up into the groin permanently, he is much freer to dissect the highest part of the rectum and lower sigmoid with the hemorrhoidal vessels, and then clean out all infected lymphatics from the pelvis *ab initio*. The operation, as a whole, is thereby simplified and abbreviated, as well as made more thorough.

6. The great majority of cases with return of disease ultimately requires artificial anus, and it should be anticipated in all by this preparation.

In conclusion, I would say that, first, operative method for cancer in different parts of the rectum must still be elective. There is no one method that applies to all. The perineal route is still the most available for very limited and very low-down growths. The Kraske sacral method is available for a moderate number of growths which exhibit slight malignancy as to infiltration, and are not more than a short finger-length within the anus. But the abdominal method combined with those just mentioned more nearly meets the present attitude of surgery in seeking as wide and thorough extirpation as possible for malignant growths. Second, the artificial inguinal anus had best always be made at the time of operation, and need not be done beforehand. Third, when the section of the rectum is made well up to the sigmoid, the ends of the severed gut should be inverted by a stout silk purse-string suture for more perfect cleanliness and handling.

DISCUSSION ON THE PAPERS OF DRS. MACDONALD, McCOSH, RICHARDSON, AND ABBE.

Dr. John Homans, of Boston.

I have not prepared any remarks on this subject. Dr. Macdonald's paper seems to me to deal with the technique of hysterectomy. I was surprised to hear him say that the modern text-books recommended the use of the clamp. As to myomectomy, I certainly think that the possibility of removing fibroid tumors from the uterus without removing the uterus is an argument in favor of the abdominal route. Following Jacobs' example, I have removed fibroid tumors by the vaginal route, using his curved knives, something like sharpened curved cheese-scoops, and cutting the tumors in pieces—"morcellement." This method is somewhat similar to the bisecting method of some of the French surgeons. The criticism of the operation would be that unless you removed the uterus—and you almost always do—you do not know how many fibroids you leave behind. Some of the tumors may be in the posterior wall, but of course you will get all of the large ones.

In regard to the technique of abdominal hysterectomy, I agree with Dr. Macdonald, and I think the method is well established. As to the removal of the uterus, there are certain cases that the French surgeons have come out more boldly about than we have, as, for example, where you have already removed the tubes, and the patient has pain and discomfort, and does not get well until you finally remove the uterus. This I generally do by the vaginal route. As long as the uterus remains the patient is often poorly. I remember two cases of hemorrhage from the uterus which I could not account for until I removed the uterus by the vaginal route, and recovery followed. I will mention one case, to me of international interest. It was that of a lady, aged sixty-three years, who was taken with hemorrhages while in Paris, several years ago. She was attended in Paris, and later in London, and the diagnosis made was cancer of the uterus, too far advanced for operation. She was brought carefully home to Newport. I saw her in August at Newport with Dr. Cleveland and the late Dr. Rusk, but we could not see any signs of uterine cancer. Later she came to Boston. In October she had such a severe hemorrhage that the blood soaked through the bed. I was asked if I would like to have Drs. Cleveland and Lusk see her again. They came on from New York, and we dilated the uterus, but could not find anything very definite except a

suspicious thickening in the right cornua. I removed the uterus by the vaginal route, when we found, up in one corner, a fibroid as large as a filbert which had been the cause of the hemorrhage. The lady recovered, and lived for many years in good health. In this case I believe the vaginal route was the better, as there was almost no shock.

In cases of cancer of the uterus where a very small part of the cervix is involved I think the vaginal route is the preferable one. I think if a case of cancer of the uterus cannot be removed with a curative result by the vaginal route it cannot by any other. Myomectomy is a very successful operation, and I have removed a dozen tumors at once in this way, leaving the uterus *in situ*. I think it a safe procedure. It is unwise and unfair to deprive a young person of the whole uterus unnecessarily. I have had two cases where the pathologist stated the fibroids were beginning to become carcinomatous, which, of course, is an argument in favor of the total extirpation of the organ in most cases. The important thing, of course, in myomectomy is to have everything aseptic.

Dr. J. W. Elliott, of Boston.

I would simply like to give my mortality in cases of hysterectomy as obtained in general surgical hospital work and private practice. I presume they are as typical as those seen by most surgeons, and they show that we can justify our position in doing hysterectomy. Since 1894 I have had 74 cases of hysterectomy. Twelve were operated upon by the vaginal or combined method for cancer, with 1 death, and 62 by abdominal hysterectomy, with 1 death, being 2 deaths in 74 cases. As to the technique of supravaginal hysterectomy, it seems to me that this is pretty well settled. The only remark I wish to make is that Dr. Kelly's division of the uterus, taking one-half at a time, is open to the criticism that you open the uterine cavity, which contains micro-organisms that are dangerous, whereas the tubes and uterus can all be gotten out perfectly well without splitting the uterus. It is objectionable to open the uterine cavity unnecessarily, because it may be septic. In doing hysterectomy I always take cēre in the beginning to surround the uterus with gauze.

As to myomectomy, ever since Dr. Dudley, of Chicago, urged this operation instead of hysterectomy I have had it constantly in mind, and have done the interstitial myomectomies freely. I confess I have been a little shy in splitting the uterine cavity, and have never been willing to do it until recently. In a recent case, in a very fat patient,

the uterus could not be raised, as the broad ligaments were very short.

I thought hysterectomy would be dangerous, so I split the uterus in two and shelled out two large fibroids and sewed up the uterus, as Dr. McCosh recommended. Being encouraged by Dr. McCosh's paper, I shall do more of these cases. In looking over my cases I find that the opportunity of doing this operation has not occurred as often in my practice as in that of Dr. McCosh. Many of my patients have been between forty-five and fifty years of age, which is too late to do a myomectomy. While in many cases of young women the myomectomy has seemed to me too dangerous or impossible, Dr. McCosh's suggestion is a very timely one. Hysterectomy has come to be too much a routine treatment of fibroids in the practice of many surgeons.

As to Dr. Richardson's paper, I agree with him in every way. I have made a few observations on this subject to which I might refer. At the time when vaginal hysterectomy for salpingitis was recommended so highly in Europe, and the reported mortality was so low, I did several vaginal hysterectomies, and tried in several cases to take out diseased tubes through the posterior cul-de-sac by the vaginal route. I had had some training as a gynecologist, and consequently felt quite at home in this route, but I was not satisfied with the operation. In several cases when I had finished the operation by the vaginal route I put the patients in the Trendelenburg position and did a laparotomy to see what I had accomplished. I found more than once that I had left parts of diseased tubes and small pockets of pus unopened. In one case I found a vessel still bleeding. This reminds me of a celebrated German surgeon who did a vaginal hysterectomy in Boston. It was done very quickly, but the patient died the next day, and the post-mortem showed that the ovarian artery had slipped out of the ligature. After these investigations and with this experience, I came to the conclusion that the abdominal route was much safer, and that the Trendelenburg position offered such advantages that it seemed to me settled the whole question. By this means you can empty the pelvis and do a perfectly plain and safe dissection, running no chances of injuring neighboring organs. I had a case the other day where a pus tube had nearly or quite eroded the intestine. I cut out a part of the side of the tube, packed with gauze, and made everything perfectly safe. How would such a condition have been treated by the vaginal operation?

Dr. Dudley P. Allen, of Cleveland.

Last night Dr. Willard, our President, stated to me that, having failed to get any one to discuss the portion of the subject before us relating to operations upon the uterus per vaginam, he wished me to present the matter to the Association. In doing so I do not wish to be misunderstood. I am a general surgeon, and the large majority of the operations which I perform upon the pelvic organs are performed by the abdominal route. There are, however, certain cases which seem to me to demand operation by the vaginal route, and that in these cases the vaginal route has special advantages. The indications for operations by the vaginal route have been placed before us in a very clear way by Dr. Richardson : in fact in a way so clear that it is necessary to say little more. The route selected by the operator will doubtless depend largely upon his experience, and a surgeon may be a most excellent operator by a method in which he has had experience and only an indifferent operator by other methods. A noted instance of this came under my observation. Some time since when abroad I visited a clinic of a surgeon who has an international reputation as being one of the very first men in his profession. He was about to remove the uterus in a case on which he had operated twice previously on account of abdominal pain without relief. One operation had been for the removal of the ovaries, and the other had been an exploratory operation with the expectation of finding gallstones. The surgeon had recently visited Paris, and had heard of the operation of Doyen for the removal of the uterus. He had not seen the operation, however. In attempting to perform it it was perfectly evident that he was unfamiliar with pelvic surgery. For the portion of the operation which a man accustomed to it would have performed in three or four minutes he occupied almost a half an hour. Had he been familiar with the vaginal method of operating he might with great ease have removed the uterus by this route. I mention this case simply to illustrate that a man of large ability as an operator in one field may be inexperienced and unsuccessful in another. As a matter of fact, many of the objections which have been urged against the vaginal method of operating are, I suspect, based upon inexperience with the method. In the hands of an experienced surgeon the method is rapid and it is safe. The objection which has been made that in operating by the vagina one operates in the dark certainly does not hold with reference to malignant growths affecting the cervix. When a malignant growth

affects the cervix, and perhaps invades the vault of the vagina, one can certainly see to remove the diseased portion more effectively by the vaginal than by the abdominal route. The question of the removal of any involvement effecting the broad ligament, of course, is a different thing. As to the removal of small fibroids from the uterus, if they are intermural or sub-peritoneal, unquestionably the operation by the abdomen is the easier operation. There are cases, however, in which there are small submucous fibroids. If these be near the cervical outlet they are unquestionably more easily reached by the vaginal than by the abdominal route. Frequently I remove fibroids from the uterus by the abdominal route, often opening the uterine cavity to secure them, closing the incision and leaving the uterus; but there are cases in which this operation may be done, in my judgment, with more ease, greater speed, and less mutilation by the vaginal than by the abdominal method. There are some cases in which there is very marked ænæmia owing to prolonged and repeated hemorrhage, in which the questions of time and shock in the operation are important factors. Under such circumstances, if the vagina be of fair size, the uterus not too large proportionately, and particularly if it be movable, the removal of the uterus by the vagina by the use of clamps is, in my judgment, more rapid, attended by less hemorrhage and by less shock than the abdominal method.

My judgment is very strongly that as surgeons we do wrong to ignore the advantages which have been demonstrated by the gynecologist to exist in operations per vaginam, and we cannot afford to deprive ourselves of the advantages belonging to this route in the performance of certain operations.

Dr. A. Vander Veer, of Albany.

My age will indicate that I have some recollection of the treatment of fibroids from the beginning of abdominal surgery. I have done all forms of operation, gradually advancing from the time of treating the pedicle by using the various forms of clamp. I keep examples of these old methods in the top drawer of the old case at the hospital, as I have seen these things disappear.

These papers have so thoroughly covered the ground that there is very little for me to say, but I heartily approve of a great deal that has been said. Dr. Allen touched a point that I am satisfied is of vital importance and that is as to whether an operation should be by

the vaginal or the supravaginal route must depend upon the man himself. Some men are familiar with one way and some with the other. The operation very often is one that many feel more familiar with one way than the other, and particularly if you can place your patient in such a position that you can see everything in the pelvic cavity. Surgeons are thus able to do the operation more satisfactorily to themselves.

Dr. McCosh's paper is excellent, and I wish to indorse many of the important points he has brought out. There are many cases in which you can do a myomectomy and still leave the uterus in good condition, while the woman feels that she has not been deprived of healthy organs.

As to the operations referred to by Dr. Macdonald, I have seen him do them a number of times, but I have never yet been in such a position that I could not remove the uterus in the Trendelenburg position. The only objection I have to the operation is splitting the uterine cavity, but I have seen Dr. Macdonald do it in a very brilliant way, and I do not think he has any reason to believe that the cavity has become infected. Dr. Homans' case was a very impressive one. In my abdominal work I am placing more and more confidence in dilatation and curettement, securing with great care a small particle so that my diagnosis may be aided or cleared up by the bacteriologist. I remember a case like Dr. Homans referred to, which came to me with a diagnosis of carcinoma. I did a thorough operation, and the patient did very well. In a corner of the uterus was found a small growth very much like that in Dr. Homans' case. The operation, pan-hysterectomy, was a very difficult one, but the patient has remained well ever since. I place a great deal of reliance upon thorough curettement, and I have seen some cases get well under this simple treatment. I do this when a patient comes to me with a fibroid. If I believe that the ovaries are diseased I tell the patient that she had better let me operate at once, and if there is any danger of pressure upon the ureters I advise prompt operation. If a woman presents some unusual symptoms I like to watch the case. If a fibroid is painful I ask to be allowed to make an exploration, with the understanding that if it is possible I shall do a myomectomy. I always like to go into the pelvis prepared to do whatever operation may be required, and this is the sum and substance of our experience. We must approach the case according to the indications present.

Dr. S. H. Weeks, of Portland, Maine.

Different operators will differ as to the relative advantages of abdominal and vaginal hysterotomy for diseases within the pelvis in general, and malignant diseases of the uterus in particular. Some surgeons claim that in all cases of cancer of the uterus, even when it commences in the cervix, the operation chosen should be abdominal hysterectomy. These surgeons believe that a much more thorough operation can be made than is possible through the vaginal route. Any enlarged lymphatic glands should be as thoroughly sought for and removed as is done in the axilla with removal of carcinoma of the breast. Other surgeons, of equal eminence, prefer the vaginal route.

It seems quite evident to my mind that no one method of operating is applicable to all cases. There are cases, I have no doubt, when the vaginal route is the best, and there are cases when the abdominal route offers superior advantages. The operating surgeon must exercise his judgment and determine in each individual case the best method to employ. Personally, I much prefer abdominal hysterectomy to the vaginal method. In many cases of abdominal hysterectomy there has been a longer exemption from a return of the disease than in those case when I have removed the disease through the vaginal route.

I have always believed that the abdominal route is the best in the majority of cases for the following reasons: first and most important, when the abdominal cavity is opened the operator has an opportunity to inspect the condition of all the structures and to decide whether or not a conservative plan of treatment can be safely followed; the abdominal route allows every step of the operation to be done under the constant supervision of the entire field; complications, such as intestinal adhesions, and particularly adhesions and abscesses about the vermiform appendix, can be seen and safely dealt with; ligatures are easily applied, and hemorrhage is seen and readily controlled; the ureter and bladder are not as likely to be injured; and finally the rapid recovery following an abdominal operation is far preferable to the struggling and prolonged suppuration and slow healing so common after removing the uterus through the vagina.

Dr. W. J. Mayo, of Rochester, Minn.

My own experience with malignant disease has been rather unsatisfactory, with the exception of carcinoma of the body of the uterus,

which has been exceptionally good. In malignant cysts of the ovaries where the cysts have ruptured and there is free fluid in the abdomen, I think the most important thing is to ascertain the condition of the body of the uterus by an incision as low down as possible before an effort at removal of the tumor is made. If the body of the uterus can be felt, the cysts should be opened, the contents allowed to run out, but the collapsed cyst wall should not be removed until after hysterectomy is done. In this way the hemorrhage which so frequently follows extirpation of the cysts is avoided. In cancer of the cervix I am not so clear. When Reis and Clark almost simultaneously brought out their method, and apparently showed that we would secure better results by removing the iliac glands with complete abdominal hysterectomy, I tried it in several cases, but I regret to say it did not do any better than the vaginal operation. The disease returned in the vicinity of the cervix. What is needed in cancer of the cervix is wider local extirpation. One danger is inoculation of the open wound by the manipulation of the cancerous mass; this is especially true of the vaginal operation as usually performed. I have seen two cases of carcinoma of the upper lip opposite a primary carcinoma of the lower lip; I have also seen the same thing in the rectum, and believe inoculation to be the cause. I am speaking now of the same individual. Heidenhain says that one should cut from two to four cubic centimetres from the visible expression of a malignant growth, and in the vaginal operation one cannot do this. The great percentage of cases that return, do so locally. The results of Byrnes with the galvanic cautery, in which he showed that he succeeded in curing a larger percentage of cases by high amputation of the cervix than the surgeon did by hysterectomy, were very instructive. In two almost identical cases I tried both methods, curetting and using the cautery on one and doing a hysterectomy on the other, and the former case did the better of the two. I finally tried doing all the work with the cautery, instead of the knife and scissors, making what might be called a clamp and cautery vaginal hysterectomy, and have certainly done very much better with this than any other method, and feel much encouraged. I wish to agree most heartily with Dr. Abbe in his conclusions as to rectal carcinoma. An operation which I have done in only two cases of cancer of the rectum is nearly identical with the one he recommends. The question of the artificial anus is an important one, but it is purely a matter of sentiment. If the opening is made in the iliac region the patient can take better care of it than

many of the Kraske results, which, as a rule, are inefficient as to control.

Dr. T. A. McGraw, of Detroit, Mich.

I operated the other day on a case which illustrated Dr. Mayo's reference to infection produced by carcinoma in the same individual, and it also illustrates the whole question of rectal surgery. The man four months ago had rectal trouble, and when he came to me I found he had a large epithelioma involving the rectum and the base of the bladder. I took out three inches of the rectum, but did not cut the bladder. He did very well at the time, but there was an immediate recurrence, and the other day I did a colotomy. Within four months of the time when I first operated the parietal peritoneum was infected. I believe the infection came from opening the peritoneum, the opening of the peritoneal cavity making a channel for the germs to get out into the peritoneum. I think Dr. Abbe's idea is correct, not only for the purpose of getting at the cancer better, but also for the sake of examining the condition of the peritoneum itself. My experience as to the recurrence of cancer of the rectum is a bad one. Even when I have operated and taken out everything they recur. It seems to me that the best thing to do is to make a colotomy in the beginning, but in doing this I have thought that I would not only do a colotomy, but would prolong the incision so that I could reach the parts below through the same opening. The question of the infection of the peritoneum in these operations is a very important one, and argues in favor of colotomy.

Dr. N. B. Carson, of St. Louis, Mo.

I was very glad to hear Dr. Richardson advocate the vaginal route for the removal of the uterus.

Recently I have adopted the vaginal route in a number of cases where in times past I had gone in from above. By so doing I have avoided the great shock which almost invariably follows that practice.

Dr. Richardson, I believe, goes in behind the uterus, while I go in in the front. Since adopting this course I have been surprised how readily and clearly the uterus and its adnexa can be exposed to view.

After opening the abdominal cavity I put the patient in the Trendelenburg position, push the intestines out of the way with a sponge or pad, enabling me to explore the parts thoroughly.

Anyone who adopts this plan will, I am sure, find it much more satisfactory than when they go in behind the uterus. If we find a condition which prevents the completion of the operation through the vagina, we can then resort to the supravaginal route.

The uterus can be readily brought forward and carefully examined for fibroids or other pathological conditions, and if small fibroids are found in its walls they can be readily removed.

I was glad to hear Dr. McCosh favor myomectomy and what he had to say on the subject. I recently had a case of a young woman with a very large fibroid involving the fundus, upon whom I intended to do a myomectomy, but after removing the large tumor from the fundus I found the walls of the uterus containing quite a number of smaller tumors. After removing these the uterus was in such a mutilated condition that I thought it was best to remove it, rather than run the risk of infection, so I removed it at the neck, as I did not feel that I was justified in leaving an organ so much mutilated. But after hearing Dr. McCosh's very interesting paper I think hereafter I shall have no hesitation as to the proper course to pursue.

Dr. E. Eliot, of New York City.

I agree with Dr. Mayo as to the gloomy prognosis in cancer of the uterus, and I think in a large number of cases this is due to the fact that the patient's attention is not attracted to the disease until after it has existed for some time. It is often already far advanced before she presents herself for treatment, yet a certain number of cases come to the surgeon with the disease in its early stages. In these cases it is practicable to excise the growth at a comparatively safe distance. As to the method of doing this, it seems to me that the abdominal part of the operation, if we are going to resort to the combined method, is indicated, as it gives excellent exposure of the pelvic part of the uterus. It permits of an adequate examination of the lymphatic glands, which is a very essential point. It is not practicable to definitely determine the condition of these glands by a bimanual examination. Even though the disease may be localized to a very small part of the cervix, nevertheless the abdominal part of the operation is indicated. So far as the vaginal part is concerned, that begins with a wide incision extended in front and behind the bladder and the anterior part of the body of the uterus. This facilitates exposure of the base of the bladder. There is one other indication for vaginal hysterectomy which has not been mentioned.

Occasionally we find a laceration of the cervix which seems to be malignant, but a microscopic examination by the pathologist may not show any indication whatever of malignancy. In these cases, particularly in women who are near the menopause, when such lacerations are especially apt to become malignant, hysterectomy is indicated, and the vaginal operation is certainly the one of choice.

Dr. M. L. Harris, of Chicago.

In reference to the combined method of removing the uterus, Dr. Eliot, of New York, spoke of beginning the operation by the vaginal route and finishing through the abdomen. I believe the procedure should be the exact reverse to this—that is, the operation should be begun above and the abdominal work completed. The patient is then put in position and the operation finished from below. This is particularly advisable in cases of carcinoma of the uterus and other conditions in which there is a foul discharge, for in these cases it is impossible to thoroughly disinfect the vagina or the uterine cavity, and by removing the parts through the vagina one avoids the danger of infecting the peritoneum or the edges of the abdominal wall.

Concerning Dr. Abbe's paper, I agree with him as to the advantages of preliminary colostomy. In the operation for carcinoma of the rectum Dr. Abbe did not mention the advantage of going through the vagina in the female. This is an extremely valuable route in many cases of carcinoma of the rectum, and I have removed as many as eight inches of the bowel by this route with very excellent results.

Dr. Joseph Ransohoff, of Cincinnati.

As to the clinical condition of cases of the high operation for cancer of the rectum, it is my experience that we do not see them until the condition is one of acute intestinal obstruction. I first make a colostomy, and I recently had a case in which I was tempted to follow the operation by the removal of the rectum, but the patient was in such a bad condition I did not do so. With the angiotribe I closed the vessels to such an extent that if I had been permitted to do a second operation through the perineum it would have been a very easy one. The future of operations for high cancer of the rectum will lie in the abdominal or combined route. The obstruction can be relieved at the first operation.

Dr. W. L. Estes, of Boston.

While I heartily indorse Dr. Abbe's suggestion as to the value of the high operation, I also think it a very valuable suggestion to do a preliminary colotomy, not only at the time of the operation, but in many cases some weeks before the anticipated operation of extirpation, especially in cases of doubtful determination as to the possibility of the safe removal of the growth. I have a case in mind where the middle segment of the rectum was involved. It was thought to be inoperable on account of the wide adhesion and infiltration of the surrounding tissues. The case was progressing very rapidly, and I suggested a colotomy to relieve the pain and to give rest to the rectum. This was done. A large amount of the inflammatory tissue seemed to disappear entirely. After some weeks the local conditions had improved so much that I did an operation for the removal of the whole growth. I made an extensive dissection and removed all the infiltrated tissues. I left a gap of several inches in the intestine. The man made a good recovery from the operation; in six months there was no indication of a return. After this period I cut down upon the divided ends of the bowel and reunited the rectum, thus establishing the continuity of the canal. I then closed the colon. The man has made a very happy recovery, and there has been no return in four years. Microscopic examination showed the growth to be a columnar epithelioma.

Dr. L. I. McArthur, of Chicago.

I would like to mention a procedure which I recommended on my admission to the Gynecological Society of Chicago, in 1887, for carcinoma of the rectum in the female. It is in relation to the position in which the artificial anus should be placed where it is not possible to bring the bowel to the surface. I reported at that time three cases of carcinoma of the rectum which I had removed through the posterior vaginal wall. In one case the Kraske incision was made, and the implantation of the bowel at the side of the sacrum was done. I did not remove the growth successfully, and in the course of a year I had to make a further resection of the bowel. I found I had very little of the rectum, and it was only possible to reach to the vaginal vault. I implanted the end of the rectum here. The patient made a good recovery, living for eighteen months, then dying with a recurrence in the liver and abdomen. I thus had opportunities of trying both the sacral and vaginal artificial anus in the same patient, who was

very enthusiastic over the fact that she had perfect control over the bowels except when very loose. She knew when to go and empty the bowel by means of the vaginal sensations, and had a certain amount of control over the fecal mass. Having had an opportunity of trying both methods, she praised the latter very highly.

Dr. O. H. Allis, of Philadelphia.

An allusion has been made to the hemorrhage in one case where the patient died the day of the operation, or soon after. This has occurred also in Philadelphia, where a celebrated operator was so unfortunate as to lose a patient by the slipping of a ligature. I have seen some beautiful operators who used very unsurgical knots which slipped. What is called a surgeon's knot is, to my mind, very unsurgical. It will do for approximating parts, but is no good for hemorrhage. I will demonstrate what I mean on the blackboard.

Dr. Macdonald. It would seem to me that this discussion this morning to a certain extent would have been very proper for a gynecological society, and it also seems to indicate that the general surgeon is going to do a gynecological practice under certain circumstances. I feel that my contribution has been a very meagre one. The other papers have presented things of so much more value that I cannot afford to speak of the things in which I am interested except in a strenuous way with relation to the matter of the bisection of the uterus in complicated hysterectomy. I do not think that it is very important whether you divide the cervix laterally or longitudinally when the question of sepsis presents itself, as I do not believe it makes any difference. I have employed my methods since 1898, and I am sure that my mortality in supravaginal hysterectomy has become progressively better and better. I have a case now that I should like to have the gentlemen see, as it is very difficult to describe things on paper. I have seen surgeons everywhere in every country experience a good deal of bleeding when attacking certain cases of fibroid tumor. I want to indorse absolutely all that Dr. McCosh has said in relation to myomectomy. It covers a group of cases in which we sometimes operate, perhaps largely, for the moral effect. The mental influence is important in many cases. I am of the impression that taking all in all the group of cases that will be found among all surgeons will show a relatively higher mortality than is necessary. Some of Dr. McCosh's

statements have been very well illustrated in a case under my care at the present time. Perhaps of all the contributions we have had this morning there is nothing more definite than Dr. Abbe's, which presents a difficult part of surgery, that of attacking carcinoma of the rectum by the abdominal route. We want to be a general surgeon, and, on the other hand, we want to be enough of a gynecologist to appreciate that the vaginal route presents many opportunities of doing good surgery.

Dr. McCosh. The choice of route depends upon one's early training. My own preference is for doing more vaginal work, especially in cases of cancer of the uterus. It is bad practice to operate, but it seems to me if a cancer has invaded the broad ligament the case is hopeless. Cancer does not confine itself to the glands, but invades also the lymphatic vessels. While the vaginal operation is more difficult, it is on the whole satisfactory, and affords better chance of a radical cure. I have done over one hundred vaginal hysterectomies and about twenty abdominal hysterectomies for cancer. In regard to myomectomy, the greatest danger to be feared is sepsis. Many speakers have expressed the view that there is sepsis in the uterine cavity. In some cases the endometrium is undoubtedly not septic, but cultures have been taken in thirty-two of my cases, and all were found to be absolutely sterile with one exception, and in this case the germ was not pyogenic. I do not mean that this proves that the endometrium is necessarily sterile. The method of taking cultures is not entirely satisfactory, but if the uterine cavity is septic it must be of a very mild grade. Dr. Vander Veer remarks that the abdominal route gives one the privilege of selecting what the operator shall do, which is no doubt true.

Dr. Richardson. The danger of wounding the ureter is alone a sufficient reason for opposing the vaginal route. In the well-lighted and accessible field about the cervix uteri that the Trendelenburg position gives, it is as easy to avoid the ureter as it is in the neck to avoid the phrenic curve or the pneumogastric. Indeed, there seems to me little danger of wounding ureters by any dissection in which anatomical relations are recognized and in which reasonable care is taken. Whether by vaginal or by abdominal route, speed is incompatible with the safety of the ureters. If the ureter is first exposed in abdominal operations near the ureter that ureter will never be wounded.

In vaginal operations upon the pelvis the ureter can be avoided only by a dissection made close to the cervix. If that cervix is widened by disease, it may then be in such close proximity to the ureter that injury to that ureter may be almost unavoidable. In neoplasms of the cervix the ureter may be so entangled that removal of the neoplasm will necessarily injure the ureter. I have in all my abdominal surgery injured the ureter but once. In that case extirpation of several inches was unavoidable, that portion running through a calcified fibroid. I am sure that the members of this Association have had a similar favorable experience. Such an immunity from disaster is owing to the employment of those anatomical methods which we use in the classical dissection of the neck, the axilla, Scarpa's triangle, and the popliteal space. When we approach important structures in the deep pelvis we cannot but resort to even more careful anatomical methods, and that is why, I take it, that the general surgeon favors the well-lighted and accessible field afforded by the supravaginal route and the Trendelenburg position.

In cancer of the cervix I like to use the vaginal route if the disease is limited to the cervix and if the uterus is freely movable. The presence of infected lymph nodes in the broad ligament or at the brim of the pelvis makes the prognosis so unfavorable that it makes little difference which route is selected. Were it possible to dissect the pelvis as thoroughly as it is possible to dissect the axilla I should have no hesitation in selecting in every case the abdominal route. The trouble is that cancer of the cervix infiltrates by direct contiguity the pericervical tissues, and, once outside the cervix, quickly surrounds the ureter. Radical operation for permanent cure by any method is then absurd.

In cancer of the cervix I like best the combined method; separation of the vaginal end may be accurate and extensive; dissection at the abdominal end thorough and safe. I agree fully with what Dr. McCosh says as to the uselessness of operating uterine cancer when the broad ligament is infected.

With reference to routes of operation in rectal cancer, I would say that the first principle to be followed is that of thorough extirpation. Every other consideration must be sacrificed to thoroughness. I so rarely find an operable case of rectal cancer that my experience in extirpations is limited. I have always used the infrapelvic route, though I have explored several times from above only to find the disease inoperable.

I find that the number of my operations performed through the vagina for pelvic lesions is steadily diminishing, until now this procedure is limited practically to hysterectomy under certain conditions and to drainage under certain conditions. As to operating upon ovaries and tubes in front of the uterus or behind it, I would say that I should never under any circumstances operate upon them through the vagina, excepting for drainage of abscess dependent upon them, under the conditions described in my paper. My reason for the abdominal route in the great majority of pelvic lesions is expressed in the single word *conservatism*—conservatism of uterus, of ovaries, and of tubes. By the vaginal route one cannot see what he ought to do or how he ought to do it; he cannot tell what he ought to avoid, what not to do, or how he can best avoid it. The two dangers—wounding of the ureter and tearing of the intestine—are enough to condemn the vaginal route.

Dr. Abbe. It seems to me that the Trendelenburg position has much to do with the success of the work of some of the members. The two classes of cases that have been discussed have been of a diametrically opposed nature, the one being an innocent fibroma and the other malignant disease. One tends toward a conservative operation and the other does not. In cancer of the rectum every improvement lies in the direction of wider incision. Until we find some medical way of treating cancer this is the only position the surgeon can take. The only real advance in breast amputation has come also from wider excision, and this is equally true of cancer of the rectum. Cancer will surely extend upward, but the peritoneum is not infected as a rule. You can get at the vessels and lymph channels fairly well. One should carry the dissection downward on the sacrum until one gets the parts comparatively cleaned away. The intestinal contents are diverted to an inguinal opening. The operation is comparatively bloodless, and will give the patient a fair chance for non-recurrence.

AN IMPROVED INSTRUMENT.

By S. H. WEEKS, M.D.,
PORTLAND, ME.

I was led to improve the ordinary male silver catheter on account of some difficulty which I have often experienced in passing the catheter into the bladder. Sometimes I have found the difficulty due to a stricture, either organic or spasmodic, and at other times due to a distended bladder, with or without an enlarged prostate.

A few weeks ago I had a patient where I could not pass the catheter until I had first passed the sound guided by a filiform bougie, which I have used for ten or twelve years with great satisfaction. After I had dilated the stricture with the sound, I then passed the silver catheter without any difficulty. The next time I attempted to pass the catheter I found it stopped at the point of stricture, and I was again obliged to use the sound with the filiform guide. The thought occurred to me that I could have the filiform bougie attached to the catheter, the same as it is attached to the sound, with this exception: instead of having the filiform bougie screwed onto the catheter the same as it is onto the sound, it is so made that it screws into the catheter, and in no way injures it for use without the filiform bougie.

I sent to Mr. George Tiemann, in New York, giving him instructions how to make it, and he sent me the instrument which I present for your inspection. It needs no explanation. The instrument speaks for itself.

It is so simple I wonder that the thought did not occur to me before, as I have so often had difficulty in passing the ordinary catheter into the bladder. I had the instrument made, and used it several times on the same patient, and had no difficulty whatever. I feel confident its advantages are apparent to you all, and that you will agree with me that it is an improved instrument.

INDEX TO VOL. XX.

Abbe, Robert, abdominal route for approaching rectal tumors, 474, 495
gunshot wounds, 49
prostatic surgery, 84
Abdominal hysterectomy, 260
hysterectomy, morcellement and bisection of the uterus in complicated, 452
route for approaching rectal tumors, 474
Acetonæmia, fatal, following an operation for acute appendicitis, 271
Acute suppurative pancreatitis, 219
Address of president, 1
Allen, Dudley P., supravaginal hysterectomy, 483
teaching of surgery, 118
Allis, Oscar H., a new method of pyloroplasty, 187, 190
supravaginal hysterectomy, 492
surgical treatment of tuberculous peritonitis, 208
Anatomical and technical reasons why the perineal is preferable to the suprapubic route in prostatic surgery, 59
Aneurism, radical cure of, based upon arteriorrhaphy, 396
Appendicitis, acute, fatal acetonæmia following an operation for, 271
Appendix vermiformis, carcinoma limited to, 228

Bell, James, gunshot wounds, 42
teaching of surgery, 126
Bevan, Arthur Dean, a new method of pyloroplasty, 179, 188
radical cure of aneurism, 432
surgical treatment of tuberculous peritonitis, 205
the present status of the X-ray as a means of diagnosis and a therapeutic agent, 435, 451
Bladder and prostate, removal of, for carcinoma through a suprapubic opening, 54
tuberculosis of, suprapubic drainage for, 67
Blumer, George, the method employed in examining and recording pathological material, 142
Bontecou, R. B., gunshot wounds, 42
Brewer, George Emerson, fatal acetonæmia following an operation for acute appendicitis, 271, 283
teaching of surgery, 122

Bryant, Joseph D., teaching of surgery, with special reference to the didactic method, 104
Bullet wounds of intraperitoneal viscera, 13
Burrell, Herbert L., surgical treatment of tuberculous peritonitis, 205
teaching of surgery, 86

Carcinoma limited to the appendix vermiformis, 228
Carson, N. B., gunshot wounds, 40
supravaginal hysterectomy, 488
Catheter, an improved, 496
Choice between the suprapubic and the infrapubic methods of reaching tumors and other surgical lesions of pelvic organs, 471
Circulus vitiosus following gastro-enterostomy, 335
Coley, W. B., influence of the Roentgen ray upon the different varieties of sarcoma, 308, 334
surgical treatment of tuberculous peritonitis, 208
Colles' fracture, shortening of radius in, 378
Curvilinear prerectal operation for prostatic abscess, 353
Cysts in connection with the teeth, 383

Da Costa, J. Chalmers, teaching of surgery, 120
Dandridge, N. P., prostatic surgery, 76
Deaver J. B., abdominal hysterectomy, 260
acute appendicitis, 282
Drainage in bullet wounds of intraperitoneal viscera, 13

Eliot, Ellsworth, radical cure of aneurism, 432
supravaginal hysterectomy, 489
teaching of surgery, 116
Elliot, John Wheelock, gunshot wounds, 49
prostatic surgery, 77
supravaginal hysterectomy, 481
Elting, Arthur W., carcinoma limited to the appendix vermiformis, 257
remarks on the method of keeping histories of surgical patients in the Albany Hospital, 148
Essentials of modern hospital construction, 130, 138, 142, 143, 148
Estes, W. L., gunshot wounds, 44
supravaginal hysterectomy, 491
the X-ray in diagnosis and therapeutics, 450
Excision of the lumbar lymphatic nodes and spermatic vein in malignant disease of the testicle, 297
Exophthalmic goitre treated by operation, 285

Fatal acetonæmia following an operation for acute appendicitis, 271
Finney, J. M. T., a new method of pyloroplasty, 165, 188
gunshot wounds, 50
prostatic surgery, 82
silver filigree for hernial apertures, 373

Fowler, George R., shortening of the radius in Colles' fracture, 378
the circulus vitiosus following gastro-enterostomy, 335

Gall-bladder and appendix, resemblances in function between, 374
Gastro-enterostomy, complications following, 151
vomiting following, 335
Gerster, A. G., carcinoma limited to the appendix vermiformis, 258
influence of the Roentgen ray on sarcoma, 333
radical cure of aneurism, 431
Goitre, exophthalmic, treated by operation, 285
Gunshot wound of stomach and liver, 10

Harris, M. L., a new method of pyloroplasty, 181
removal of bladder and prostate for carcinoma through a suprapubic opening, 54
supravaginal hysterectomy, 490
Harte, Richard H., carcinoma limited to the appendix vermiformis, discussion of its origin and its relation to appendicitis, 228, 259
case of severed spinal cord in which myelorrhaphy was followed by partial return of function, 28
Hernial apertures, implantation of silver filigree for the closure of, 362
Homans, J., supravaginal hysterectomy, 480
Hysterectomy, abdominal, 260

Implantation of silver filigree for the closure of large hernial apertures, 362
Instrument, an improved, 496
Intraperitoneal viscera, bullet wounds of, 13

Joints, wounds of large, by modern military projectiles, 18

Kammerer, Frederick, a new method of pyloroplasty, 182

Leukæmic enlargement, splenectomy for, 210
Lumbar lymphatic nodes, excision of, in malignant disease of the testicle, 297

McArthur, L. L., gunshot wounds, 50
supravaginal hysterectomy, 491
the X-ray in diagnosis and therapeutics, 447
McCosh, A. J., myomectomy *vs.* hysterectomy, 458, 493
McGraw, Theodore A., a new method of pyloroplasty, 184
case of splenectomy for leukæmic enlargement, 210
gunshot wounds, 45, 50
influence of the Roentgen ray on sarcoma, 333
supravaginal hysterectomy, 488
Macdonald, W. G., gunshot wounds, 43
morcellement and bisection of the uterus in complicated abdominal hysterectomy, 452, 492

Matas, Rudolph, an operation for the radical cure of aneurism based upon arteriorrhaphy, 396, 433
carcinoma limited to the appendix vermiformis, 258
teaching of surgery, 113
Mayo, William J., a new method of pyloroplasty, 188, 190
complications following gastro-enterostomy, 151
radical cure of aneurism, 431
supravaginal hysterectomy, 486
surgical treatment of tuberculous peritonitis, 206
Meyer, Willy, a new method of pyloroplasty, 180
implantation of silver filigree for the closure of large hernial apertures, 362, 373
prostatic surgery, 81
splenectomy for leukæmic enlargement, 217
the X-ray in diagnosis and therapeutics, 447
Modern hospital construction, essentials of, 130, 138, 142, 143, 148
Moore, James E., anatomical and technical reasons why the perineal is preferable to the suprapubic route in prostatic surgery, 59, 84
teaching of surgery, 121
the X-ray in diagnosis and therapeutics, 449
Morcellement and bisection of the uterus in complicated abdominal hysterectomy, 452
Mosher, J. M., essentials of modern hospital construction, 138
Munro, John C., teaching of surgery, 127
Murray, F. W., case of acute suppurative pancreatitis, 219
Myomectomy *vs.* hysterectomy, 458

Nancrede, C. B., results of wounds of the large joints by modern military projectiles, 18, 40, 52
teaching of surgery, 128

Ochsner, A. J., a new method of pyloroplasty, 185
influence of the Roentgen ray on sarcoma, 332
prostatic surgery, 80
surgical treatment of tuberculous peritonitis, 191, 208
teaching of surgery, 128
the X-ray in diagnosis and therapeutics, 448
Oliver, J. C., cysts in connection with the teeth, 383
Owens, John E., gunshot wounds, 48
prostatic surgery, 78

Pancreatitis, acute suppurative, 219
Park, Roswell, perforating gunshot wound of stomach and liver, with posterior through drainage, and recovery, 10, 51
why should we not treat the gall-bladder as we do the appendix? 374
Perforating gunshot wound of stomach and liver, 10

Peritonitis, tuberculous, surgical treatment of, 191
Powers, Charles A., permanent suprapubic drainage for advanced tuberculosis of the bladder, 67
the X-ray in diagnosis and therapeutics, 449
Present status of the X-ray as a means of diagnosis and a therapeutic agent, 435
President, address of, 1
Prostatic abscess, curvilinear prerectal operation for, 353
surgery, 59
Pyloroplasty, new method of, 165
Radical cure of aneurism, operation for, based upon arteriorrhaphy, 396
Radius, shortening of, in Colles' fracture, 378
Ransohoff, Joseph, a new method of pyloroplasty, 187
curvilinear prerectal operation for prostatic abscess, 353
radical cure of aneurism, 431
supravaginal hysterectomy, 490

Rectal tumors, abdominal route in removal of, 474
Removal of bladder and prostate for carcinoma through a suprapubic opening, 54
Richardson, C. H., aseptic technique in the Albany Hospital, 143
Richardson, M. H., a new method of pyloroplasty, 178
influence of the Roentgen ray on sarcoma, 331
splenectomy for leukæmic enlargement, 217
surgical treatment of tuberculous peritonitis, 206
teaching of surgery, 117
the choice between the suprapubic and the infrapubic methods of reaching tumors and other surgical lesions of the pelvic organs, 471, 493
Rixford, Emmet, gunshot wounds, 48
prostatic surgery, 83
two cases of exophthalmic goitre treated by operation, 285
Roberts, J. B., excision of the lumbar lymphatic nodes and spermatic veins in malignant disease of the testicle, 297
Rodman, W. L., a new method of pyloroplasty, 186
gunshot wounds, 39
the X-ray in diagnosis and therapeutics, 450
Roentgen ray, influence of, upon the different varieties of sarcoma, 308

Sarcoma, influence of Roentgen ray upon the different varieties of, 308
Severed spinal cord in which myelorrhaphy was followed by partial function, 28
Shortness of the radius in Colles' fracture, 378
Silver filigree, implantation of, for the closure of large hernial apertures, 362
Splenectomy for leukæmic enlargement, 210
Stewart, Francis T., case of severed spinal cord in which myelorrhaphy was followed by partial return of function, 28

Stomach and liver, perforating gunshot wound of, 10
Suppurative pancreatitis, acute, 219
Suprapubic drainage for advanced tuberculosis of the bladder, 67
Surgery, prostatic, 59
    teaching of, 86, 104

Teaching of surgery, 86, 104
Teeth, cysts in connection with, 383
Testicle, malignant disease of, 297
Tiffany, L. M., the great importance of drainage in bullet wounds of intraperitoneal viscera, 13, 51
Tuberculosis of bladder, suprapubic drainage for, 67
Tuberculous peritonitis, surgical treatment of, 191
Tumors, rectal, abdominal route in removal of, 474

Uterus, morcellement and bisection of, in complicated abdominal hysterectomy, 452

Vander Veer, Albert, a new method of pyloroplasty, 182
    gunshot wounds, 46, 51
    supravaginal hysterectomy, 484
    the essentials of modern hospital construction, 130
    the X-ray in diagnosis and therapeutics, 447

Watson, F. S., prostatic surgery, 72
Weeks, S. H., an improved instrument, 496
    gunshot wounds, 46
    supravaginal hysterectomy, 486
Weir, Robert F., a new method of pyloroplasty, 183, 188
    carcinoma limited to the appendix vermiformis, 258
    prostatic surgery, 79
    surgical treatment of tuberculous peritonitis, 207
    teaching of surgery, 124
Why should we not treat the gall-bladder as we do the appendix? 374
Willard, De Forest, address of president, 1
Willson, Robert N., carcinoma limited to the appendix vermiformis, discussion of its origin and its relation to appendicitis, 228
Wounds of the large joints, results of, by modern military projectiles, 18

X-rays as a means of diagnosis and a therapeutic agent, 435

APPENDIX.

FELLOWS OF THE AMERICAN SURGICAL ASSOCIATION,

1880–1902.

FOUNDER,

SAMUEL DAVID GROSS, M.D., LL.D., D.C.L. Oxon., LL.D. Cantab., LL.D. Edin.

OFFICERS.

Presidents.

ELECTED

1880. Samuel David Gross, M.D., LL.D., D.C.L. Oxon., LL.D. Cantab., LL.D. Edin.
1883. Edward Mott Moore, M.D., LL.D.
1884. William Thompson Briggs, M.D.
1885. Moses Gunn, A.M., M.D., LL.D.
1886. Hunter McGuire, M.D., LL.D.
1887. D. Hayes Agnew, M.D., LL.D.
1888. David Williams Cheever, M.D.
1889. David W. Yandell, M.D.
1890. Claudius Henry Mastin, M.D., LL.D.
1891. Phineas Sanborn Conner, M.D., LL.D.
1892. Nicholas Senn, M.D.
1893. J. Ewing Mears, A.M., M.D.
1894. Frederic S. Dennis, M.D.
1895. Louis McLane Tiffany, A.M. Cantab., M.D.
1896. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng.
1897. Theodore P. Prewitt, M.D.
1898. William W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1899. Robert F. Weir, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.

ELECTED

1900. Roswell Park, M.D.
1901. De Forest Willard, M.D.
1902. Maurice H. Richardson, M.D.

Vice-Presidents.

1880. Louis Alexander Dugas, M.D., LL.D.
1880. James Rushmore Wood, M.D., LL.D.
1882. Edward Mott Moore, M.D., LL.D.
1882. Moses Gunn, A.M., M.D., LL.D.
1883. William Wirt Dawson, M.D.
1883. Claudius Henry Mastin, M.D., LL.D.
1884. Joseph Chrisman Hutchison, M.D., LL.D.
1884. Elisha H. Gregory, M.D., LL.D.
1885. Christopher Johnston, M.D.
1885. Thomas P. Russell, M.D.
1886. T. F. Prewitt, M.D.
1886. J. W. S. Gouley, M.D.
1887. Nicholas Senn, M.D., Ph.D., LL.D.
1887. Frederic Shepard Dennis, M.D.
1888. T. G. Richardson, M.D.
1888. John B. Roberts, M.D.
1889. Claudius Henry Mastin, M.D., LL.D.
1889. C. B. Nancrede, A.M., M.D.
1890. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng
1890. Stephen Smith, A.M., M.D.
1891. Louis McLane Tiffany, A.M. Cantab., M.D.
1891. Levi Cooper Lane, A.M., M.D.
1892. Charles B. Porter, M.D.
1892. W. W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1893. Roswell Park, A.M., M.D.
1893. Lewis S. Pilcher, M.D.
1894. Jacob Rowland Weist, A.M., M.D.
1894. John B. Roberts, A.M., M.D.
1895. Christian Fenger, M.D.
1895. William H. Carmalt, A.M., M.D.
1896. Theodore A. McGraw, M.D.
1896. John Ashhurst, Jr., M.D.
1897. James McFadden Gaston, A.B., M.D.
1897. Maurice Howe Richardson, A.B., M.D.
1898. Albert Vander Veer, A.M., M.D., Ph.D.
1898. Solon Marks, M.D.
1899. C. B. Nancrede, A.M., M.D.
1899. Edmond Souchon, M.D.
1900. John E. Owens, M.D.

ELECTED

1900. Clayton Parkhill, M.D.
1901. Robert Abbe, M.D.
1901. Rudolph Matas, M.D.
1902. N. B. Carson, M.D.
1902. W. J. Mayo, M.D.

Secretaries.

1880. Jacob Rowland Weist, M.D.
1894. Maurice H. Richardson, A.B., M.D.
1897. Herbert L. Burrell, M.D.
1901. Dudley P. Allen, M.D.

Corresponding Secretary.

1880. William Thompson Briggs, M.D.

Treasurers.

1880. John H. Packard, M.D.
1884. John H. Brinton, M.D.
1886. Phineas Sanborn Conner, M.D., LL.D.
1891. John B. Roberts, A.M., M.D.
1894. Nathaniel P. Dandridge, M.D.
1897. George Ryerson Fowler, M.D.

Recorders.

1881. J. Ewing Mears, A.M., M.D.
1893. De Forest Willard, A.M., M.D.
1901. Richard H. Harte, M.D.

Members of Council.

1880. Moses Gunn, M.D.
1880. John T. Hodgen, M.D.
1880. Hunter McGuire, M.D.
1880. Robert Alexander Kinloch, M.D.
1880. Joseph Chrisman Hutchison, M.D.
1881. William Thompson Briggs, M.D.
1881. John W. S. Gouley, M.D.
1882. Richard Beverly Cole, M.D.
1882. George Washington Gay, M.D.
1882. Henry Fraser Campbell, M.D.
1883. Phineas Sanborn Conner, M.D., LL.D.
1884. John Shaw Billings, U. S. A., M.D., LL.D.
1885. L. McLane Tiffany, A.M. Cantab., M.D.
1888. W. F. Peck, M.D.
1888. Samuel W. Gross, M.D., LL.D.

ELECTED

1889. Frederic Shepard Dennis, M.D.
1890. Stephen H. Weeks, M.D.
1891. Claudius Henry Mastin, M.D., LL.D.
1892. Roswell Park, A.M., M.D.
1892. Robert F. Weir, A.M., M.D., LL.D., Hon F.R.C.S. Eng.
1894. Theodore F. Prewitt, M.D.
1895. Phineas S. Conner, M.D., LL.D.
1895. Maurice H. Richardson, M.D.
1895. De Forest Willard, M.D.
1895. N. P. Dandridge, M. D.
1896. Louis McLane Tiffany, A.M., M.D.
1897. Nicholas Senn, M.D., Ph.D., LL.D.
1897. John Collins Warren, M.D., LL.D., Hon. F.R.C.S. Eng.
1897. George R. Fowler, M.D.
1898. William W. Keen, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1898. Herbert L. Burrell, M.D.
1899. Phineas S. Conner, M.D., LL.D.
1899. Robert F. Weir, A.M., M.D., LL.D., Hon. F.R.C.S. Eng.
1900. Roswell Park, A.M., M.D.
1901. Dudley P. Allen, M.D.
1901. Richard H. Harte, M.D.
1902. De Forest Willard, M.D.
1902. Maurice H. Richardson, M.D.

ORIGINAL FELLOWS.

ELECTED	NAME	RESIDENCE
1880.	Ashhurst, John, Jr.,	Philadelphia, Pa.
1880.	Benham, Silas Nelson,	Pittsburg, Pa.
1880.	Bramble, D. D.,	Cincinnati, O.
1880.	Briggs, William Thompson,	Nashville, Tenn.
1880.	Brinton, John H.,	Philadelphia, Pa.
1880.	Brock, Hugh W.,	Morgantown, W. Va.
1880.	Byrd, William Andrew,	Quincy, Ill.
1880.	Cabell, James L.,	University of Virginia, Va.
1880.	Campbell, Henry Fraser,	Augusta, Ga.
1880.	Coleman, John Scott,	Augusta, Ga.
1880.	Conner, Phineas Sanborn,	Cincinnati, O.
1880.	Davis, Samuel T.,	Lancaster, Pa.
1880.	Dawson, William Wirt,	Cincinnati, O.
1880.	Dugas, Louis Alexander,	Augusta, Ga.
1880.	Gouley, J. W. S.,	New York, N. Y.
1880.	Greene, W. Warren,	Portland, Maine.
1880.	Gross, Samuel D.,	Philadelphia, Pa.

ELECTED	NAME	RESIDENCE
1880.	Gross, Samuel W.,	Philadelphia, Pa.
1880.	Gunn, Moses,	Chicago, Ill.
1880.	Hodge, H. Lenox,	Philadelphia, Pa.
1880.	Hodgen, John T.,	St. Louis, Mo.
1880.	Hughes, J. C.,	Keokuk, Ia.
1880.	Hutchison, Joseph Chrisman,	Brooklyn, N. Y.
1880.	Johnston, Christopher,	Baltimore, Md.
1880.	Keen, William Williams,	Philadelphia, Pa.
1880.	Keller, James McDonald,	Hot Springs, Ark.
1880.	Kinloch, Robert Alexander,	Charleston, S. C.
1880.	Levis, Richard J.,	Philadelphia, Pa.
1880.	McGuire, Hunter,	Richmond, Va.
1880.	Marks, Solon,	Milwaukee, Wis.
1880.	Mastin, Claudius Henry,	Mobile, Ala.
1880.	Mears, J. Ewing,	Philadelphia, Pa.
1880.	Moore, Edward Mott,	Rochester, N. Y.
1880.	Morton, Thomas George,	Philadelphia, Pa.
1880.	Packard, John H.,	Philadelphia, Pa.
1880.	Pancoast, William Henry,	Philadelphia, Pa.
1880.	Pollock, Alexander M.,	Pittsburg, Pa.
1880.	Richardson, Tobias G.,	New Orleans, La.
1880.	Russell, Thomas Pember,	Oshkosh, Wis.
1880.	Sayre, Lewis Albert,	New York, N. Y.
1880.	Swinburne, John,	New York, N. Y.
1880.	Tremaine, William S.,	Buffalo, N. Y.
1880.	Wales, Philip Skinner,	Washington, D. C.
1880.	Weist, Jacob Rowland,	Richmond, Ind.
1880.	Westmoreland, W. F.,	Atlanta, Ga.
1880.	Wood, James R.,	New York, N. Y.
1880.	Yandell, David W.,	Louisville, Ky.

ACTIVE FELLOWS ELECTED.

ELECTED	NAME	RESIDENCE
1890.	Abbe, Robert,	New York, N. Y.
1882.	Agnew, D. Hayes,	Philadelphia, Pa.
1894.	Allen, Dudley P.,	Cleveland, O.
1890.	Allis, Oscar H.	Philadelphia, Pa.
1902.	Andrews, E. W.,	Chicago, Ill.
1901.	Armstrong, George E.,	Montreal, Canada.
1882.	Barton, James M.,	Philadelphia, Pa.
1896.	Baxter, George A.,	Chattanooga, Tenn.
1901.	Bell, James,	Montreal, Canada.
1900.	Bevan, Arthur Dean,	Chicago, Ill.
1882.	Billings, John Shaw,	Washington, D. C.

ELECTED	NAME	RESIDENCE
1901.	Binnie, B. F.,	Kansas City, Mo.
1902.	Blake, J. A.,	New York, N. Y.
1901.	Bloodgood, Joseph C.,	Baltimore, Md.
1882.	Bontecou, Reed Brockway,	Troy, N. Y.
1901.	Bosher, Lewis C.,	Richmond, Va.
1882.	Bozeman, Nathan,	New York, N. Y.
1890.	Bradford, E. H.,	Boston, Mass.
1900.	Brewer, George Emerson,	New York, N. Y.
1895.	Bryant, Joseph D.,	New York, N. Y.
1882.	Bull, William Tillinghast,	New York, N. Y.
1900.	Bunts, Frank E.,	Cleveland, O.
1893.	Burrell, Herbert Leslie,	Boston, Mass.
1889.	Cabot, Arthur T.,	Boston, Mass.
1885.	Carmalt, William,	New Haven, Conn.
1896.	Carson, Norman Bruce,	St. Louis, Mo.
1882.	Cheever, David Williams,	Boston, Mass.
1896.	Cole, Charles Knox,	Helena, Montana.
1881.	Cole, Richard Beverly,	San Francisco, Cal.
1898.	Coley, William B.,	New York, N. Y.
1882.	Comingor, John A.,	Indianapolis, Ind.
1882.	Cunningham, Francis Deane,	Richmond, Va.
1896.	Curtis, Benjamin Farquhar,	New York, N. Y.
1896.	Cushing, Hayward Warren,	Boston, Mass.
1897.	Da Costa, John Chalmers,	Philadelphia, Pa.
1883.	Dandridge, N. P.,	Cincinnati, O.
1882.	Davis, J. S.,	University of Virginia, Va.
1892.	Deaver, John B.,	Philadelphia, Pa.
1882.	Dennis, Frederic Shepard,	New York, N. Y.
1882.	Detmold, William,	New York, N. Y.
1899.	Dunn, James H.,	Minneapolis, Minn.
1882.	Dunott, Thomas J.,	Harrisburg, Pa.
1901.	Eliot, Ellsworth, Jr.,	New York, N. Y.
1893.	Elliot, John Wheelock,	Boston, Mass.
1896.	Estes, William Lawrence,	South Bethlehem, Pa.
1898.	Eve, Duncan,	Nashville, Tenn.
1883.	Fenger, Christian,	Chicago, Ill.
1901.	Ferguson, Alexander Hugh,	Chicago, Ill.
1882.	Fifield, William Cranch Bond,	Boston, Mass.
1899.	Finney, John M. T.,	Baltimore, Md.
1882.	Forbes, William Smith,	Philadelphia, Pa.
1891.	Fowler, George R.,	Brooklyn, N. Y.
1898.	Freeman, Leonard,	Denver, Col.
1893.	Gaston, James McFadden,	Atlanta, Ga.
1882.	Gay, George Washington,	Boston, Mass.
1892.	Gerrish, Frederic H.,	Portland, Maine.

ELECTED	NAME	RESIDENCE
1890.	Gerster, Arpad G.,	New York, N. Y.
1882.	Gregory, Elisha H.,	St. Louis, Mo.
1892.	Halsted, William S.,	Baltimore, Md.
1901.	Harris, Malcolm L.,	Chicago, Ill.
1898.	Harrington, Francis B.,	Boston, Mass.
1895.	Harte, Richard H.,	Philadelphia, Pa.
1898.	Hearn, W. Joseph,	Philadelphia, Pa.
1882.	Hewson, Addinell,	Philadelphia, Pa.
1889.	Homans, John,	Boston, Mass.
1899.	Horwitz, Orville,	Philadelphia, Pa.
1901.	Huntington, Thomas W.,	San Francisco, Cal.
1882.	Isham, R. N.,	Chicago, Ill.
1901.	Jacobson, Nathan,	Syracuse, N. Y.
1901.	Johnson, Alexander B.,	New York, N. Y.
1896.	Johnston, George Ben,	Richmond, Va.
1901.	Jonas, A. F.,	Omaha, Neb.
1899.	Kammerer, Frederick,	New York, N. Y.
1899.	Lane, Levi Cooper,	San Francisco, Cal.
1901.	La Garde, Louis A.,	Washington, D. C.
1901.	Le Conte, Robert G.,	Philadelphia, Pa.
1889.	Lange, Frederick E.,	New York, N. Y.
1882.	Little, J. L.,	New York, N. Y.
1901.	McArthur, L. L.,	Chicago, Ill.
1892.	McBurney, Charles,	Albany, N. Y.
1883.	McCann, James,	Pittsburg, Pa.
1896.	McCosh, Andrew J.,	New York, N. Y.
1882.	McGraw, Theodore A.,	Detroit, Mich.
1882.	McLean, Le Roy,	Troy, N. Y.
1901.	Macdonald, Willis G.,	Albany, N. Y.
1882.	Maclean, Donald,	Detroit, Mich.
1899.	Markoe, Francis H.,	New York, N. Y.
1898.	Martin, Edward,	Philadelphia, Pa.
1887.	Mastin, William McDowell,	Mobile, Alabama.
1895.	Matas, Rudolph,	New Orleans, La.
1899.	Mayo, William J.,	Rochester, Minn.
1901.	Meyer, Willy,	New York, N. Y.
1885.	Michael, Jacob Edwin,	Baltimore, Md.
1893.	Millard, Perry H.,	St. Paul, Minn.
1893.	Miles, Albert Baldwin,	New Orleans, La.
1898.	Miller, Truman W.,	Chicago, Ill.
1893.	Mixter, Samuel Jason,	Boston, Mass.
1896.	Monks, George Howard,	Boston, Mass.
1895.	Moore, James E.,	Minneapolis, Minn.
1898.	Morton, Thomas S. K.,	Philadelphia, Pa.
1886.	Mudd, H. H.,	St. Louis, Mo.

ELECTED	NAME	RESIDENCE
1900.	Munro, John C.,	Boston, Mass.
1902.	Murphy, J. B.,	Chicago, Ill.
1898.	Murray, Francis W.,	New York, N. Y.,
1882.	Nancrede, Charles Beylard,	Ann Arbor, Mich.
1882.	Norris, Basil,	Washington, D. C.
1900.	Ochsner, A. J.,	Chicago, Ill.
1900.	Oliver, J. C.,	Cincinnati, O.
1882.	Owens, John E.,	Chicago, Ill.
1899.	Parham, F. W.,	New Orleans, La.
1885.	Park, Roswell,	Buffalo, N. Y.
1882.	Parkes, Charles T.,	Chicago, Ill.
1896.	Parkhill, Clayton,	Denver, Col.
1893.	Parmenter, John,	Buffalo, N. Y.
1883.	Peck, Washington F.,	Davenport, Ia.
1889.	Pilcher, Lewis S.,	Brooklyn, N. Y.
1887.	Porter, Charles Burnham,	Boston, Mass.
1882.	Porter, William Gibbs,	Philadelphia, Pa.
1896.	Powers, Charles A.,	Denver, Col.
1882.	Prewitt, Theodore F.,	St. Louis, Mo.
1882.	Prince, David,	Jacksonville, Ill.
1886.	Ransohoff, Joseph,	Cincinnati, O.
1882.	Reed, Thomas B.,	Philadelphia, Pa.
1887.	Richardson, Maurice Howe,	Boston, Mass.
1901.	Rixford, Emmet,	San Francisco, Cal.
1882.	Roberts, John B.,	Philadelphia, Pa.
1898.	Rodman, William L.,	Philadelphia, Pa.
1882.	Rushmore, John Dikeman,	Brooklyn, N. Y.
1882.	Sabine, Thomas Taunton,	New York, N. Y.
1882.	Senn, Nicholas,	Chicago, Ill.
1902.	Shepherd, F. J.,	Montreal, Canada.
1882.	Smith, Alan Penniman,	Baltimore, Md.
1882.	Smith, Stephen,	New York, N. Y.
1895.	Souchon, Edmond,	New Orleans, La.
1882.	Squire, T. H.,	Elmira, N. Y.
1889.	Stimson, Lewis A.,	New York, N. Y.
1883.	Taylor, William Edwin,	San Francisco, Cal.
1900.	Taylor, William J.,	Philadelphia, Pa.
1885.	Thompson, J. Ford,	Washington, D. C.
1882.	Thompson, J. W.,	Paducah, Ky.
1882.	Thomson, William,	Philadelphia, Pa.
1882.	Tiffany, Louis McLane,	Baltimore, Md.
1882.	Vander Veer, Albert,	Albany, N. Y.
1885.	Varick, Theodore R.,	Jersey City, N. J.
1902.	Vaughan, Geo. Tully,	Washington, D. C.
1891.	Walker, Edward W.,	Cincinnati, O.

ELECTED	NAME	RESIDENCE
1882.	Warren, John Collins,	Boston, Mass.
1882.	Watson, B. A.,	Jersey City, N. J.
1896.	Watson, Francis Sedgwick,	Boston, Mass.
1889.	Weeks, Stephen H.,	Portland, Me.
1889.	Weir, Robert F.,	New York, N. Y.
1892.	Wharton, Henry R.,	Philadelphia, Pa.
1882.	White, J. William,	Philadelphia, Pa.
1891.	Wight, Jarvis Sherman,	Brooklyn, N. Y.
1882.	Willard, De Forest,	Philadelphia, Pa.
1901.	Woolsey, George,	New York, N. Y.

FELLOWS RESIGNED.

NAME	DATE OF RESIGNATION
Billings, J. S.,	April, 1898.
Bozeman, Nathan,	May, 1887.
Cabell, James L.,	September, 1888.
Coleman, J. S.,	May, 1890.
Detmold, William,	September, 1888.
Fifield, William C.,	September, 1888.
Gregory, E. H.,	May, 1893.
Hutchison, J. C.,	May, 1887.
McBurney, Charles G.,	April, 1898.
Maclean, Donald,	May, 1890.
Morton, Thomas G.,	May, 1902.
Packard, J. H.,	May, 1900.
Peters, George A.,	June, 1883.
Stimson, L. A.,	April, 1898.
Wales, P. S.,	May, 1887.

FELLOWSHIP FORFEITED.

NAME	DATE FORFEITED
Cole, R. Beverly,	May, 1887.
Comingor, J. A.,	May, 1893.
Davis, S. T.,	May, 1890.
*Fenger, C.,	May, 1890.
Gouley, J. W. S.,	May, 1890.
Hewson, A.,	May, 1887.
Isham, R. N.,	April, 1898.
Keller, J. M.,	May, 1887.
McLean, Leroy,	May, 1890.
Michael, J. E.,	May, 1895
Pollock, A. M.,	May, 1890.

* Re-elected, 1893.

NAME	DATE FORFEITED
Russell, Thomas C.,	May, 1893.
Smith, A. P.,	May, 1894.
Swinburne, John,	September, 1888.
Taylor, W. E.,	May, 1895.
Tremaine, W. S.	May, 1895.
Westmorland, W. F.,	September, 1888.

FELLOWS DECEASED.

NAME	DATE OF DEATH
Agnew, D. Hayes,	March 22, 1892.
Ashhurst, John, Jr.,	July 7, 1900.
Benham, Silas Nelson,	November 3, 1890.
Briggs, William Thompson,	June 13, 1894.
Brock, Hugh W.,	April 24, 1882.
Byrd, William Andrew,	August 14, 1887.
Campbell, Henry Fraser,	December 15, 1891.
Cunningham, Francis Deane,	September 11, 1885.
Davis, John Staige,	July 18, 1885.
Dawson, William Wirt,	February 16, 1893.
Dugas, Louis Alexander,	October 19, 1884.
Dunott, Thomas Justus,	May 20, 1893.
Fenger, Christian,	March 7, 1902.
Greene, W. Warren,	September 10, 1881.
Gross, Samuel David,	May 6, 1884.
Gross, Samuel Weissel,	April 16, 1889.
Gunn, Moses,	November 4, 1887.
Hodge, H. Lenox,	June 16, 1881.
Hodgen, John T.,	April 28, 1882.
Hughes, J. C.,	August 10, 1881.
Johnston, Christopher,	October 11, 1891.
Kinloch, Robert Alexander,	December 23, 1891.
Lane, Levi C.,	February 19, 1902.
Levis, Richard J.,	November 12, 1890.
Little, James Lawrence,	April 4, 1885.
McCann, James,	—— 1893.
McGuire, Hunter,	September 19, 1900.
Mastin, Claudius Henry,	October 3, 1898.
Michael, J. Edwin,	December 7, 1895.
Miles, Albert B.,	August 5, 1894.
Millard, Perry H.,	February 1, 1897.
Mudd, Henry Hodgen,	November 20, 1899.
Norris, Basil E.,	October, 1895.
Pancoast, William H.,	January 5, 1897
Parkes, Charles T.,	March 28, 1891.

NAME	DATE OF DEATH
Parkhill, Clayton,	January 16, 1902.
Peck, Washington F.,	December 12, 1891.
Prince, David,	December 19, 1889.
Reed, Thomas Baird,	April 1, 1891.
Richardson, Tobias G.,	May 26, 1892.
Sabine, Thomas Taunton,	August 23, 1888.
Squire, Truman Hoffman,	November 27, 1889.
Thompson, Joseph W.,	March 30, 1886.
Varick, Theodore Romeyn,	November 23, 1887.
Watson, Beriah Andrew,	December 22, 1892.
Weist, Jacob Rowland,	May 14, 1900.
Wight, Jarvis S.,	November 16, 1901.
Wood, James R.,	May 4, 1882.
Yandel, David Wendell,	May 2, 1898.

HONORARY FELLOWS.

ELECTED	NAME	RESIDENCE
1885.	Annandale, Thomas,	Edinburgh, Scotland.
1882.	Atlee, John L.,	Lancaster, Pa.
1886.	Bigelow, Henry J.,	Boston, Mass.
1885.	Billroth, A. C. Theodor,	Vienna, Austria.
1891.	Bryant, Thomas,	London, England.
1891.	Chiene, John,	Edinburgh, Scotland.
1885.	Czerny, Vincent,	Heidelberg, Germany.
1891.	Durham, Arthur Edward,	London, England.
1885.	Erichsen, Sir John Eric,	London, England.
1893.	Gussenbauer, Carl,	Prague, Germany.
1891.	Harrison, Reginald,	London, England.
1890.	Horsley, Victor A. H.,	London, England.
1882.	Horwitz, P. J.,	Philadelphia, Pa.
1882.	Hunt, William,	Philadelphia, Pa.
1896.	Humphry, Sir George Murray,	Cambridge, England.
1894.	Kocher, Theodor,	Berne, Switzerland.
1885.	Lister, Lord Joseph,	London, England.
1886.	MacCormac, Sir William,	London, England.
1894.	Macewen, William,	Glasgow, Scotland.
1896.	Moore, Edward Mott,	Rochester, N. Y.
1887.	Ollier, Dr. Leopold,	Lyons, France.
1885.	Paget, Sir James,	London, England.
1882.	Parker, Willard,	New York, N. Y.
1894.	Péan, Jules E.,	Paris, France.
1882.	Post, Alfred C.,	New York, N. Y.
1902.	Robson, A. W. Mayo,	Leeds, England.
1894.	Schede, M. H. E. W.,	Hamburg, Germany

ELECTED	NAME	RESIDENCE
1882.	Sims, J. Marion,	New York, N. Y.
1882.	Smith, Stephen,	New York, N. Y.
1896.	Terrier, Felix,	Paris, France.
1894.	Thiersch, Karl,	Leipzig, Germany.
1885.	Verneuil, A. A. S.,	Paris, France.
1894.	von Bergmann, Ernst,	Berlin, Germany.
1885.	von Esmarch, Friedrich,	Kiel, Germany.
1886.	von Langenbeck, Bernhardt,	Wiesbaden, Germany
1885.	von Nussbaum, J. N.,	Munich, Germany.
1885.	von Volkmann, Richard,	Halle, Germany.
1894.	Wells, Sir Thomas Spencer,	London, England.
1896.	Yandell, David W.,	Louisville, Ky.

HONORARY FELLOW RESIGNED.

NAME	DATE OF RESIGNATION
Post, Alfred C.,	September, 1888.

HONORARY FELLOWS DECEASED.

NAME	DATE OF DEATH
Atlee, John Light,	October 1, 1885.
Bigelow, Henry Jacob,	October 30, 1890.
Billroth, Albert Christian Theodor,	January 5, 1894.
Durham, Arthur Edward,	May 7, 1895.
Erichsen, Sir John Eric,	September 23, 1896.
Humphry, Sir George Murray,	September 24, 1896.
Hunt, William,	January 5, 1897.
MacCormac, Sir William,	December 4, 1901.
Moore, Edward Mott,	March 3, 1902.
Parker, Willard,	April 25, 1884.
Péan, Jules E.,	January 30, 1898.
Paget, Sir James,	December 30, 1899.
Sims, J. Marion,	November 13, 1883.
Thiersch, Karl,	April 28, 1895.
von Langenbeck, Bernhardt,	September 30, 1887.
von Nussbaum, J. N.,	October 31, 1890.
von Volkmann, Richard,	November 28, 1889
Verneuil, Aristide A. S.,	June 11, 1895.
Wells, Sir Thomas Spencer,	January 31, 1897.
Yandell, David W.,	May 2, 1898.

INDEX OF VOLS. I.—XX.

1880—1902.

A

Abbe, Robert, abdominal route for approaching rectal tumors, vol. xx, 1902, 474, 495
castration for enlarged prostate, vol. xiv, 1896, 237
cure of facial neuralgia, vol. xiv, 1896, 48
discussion on anæsthesia, vol. xiii, 1895, 202
effect of anæsthesia, vol. xiv, 1896, 388
gunshot wounds, vol. xx, 1902, 49
improved method of exploring thoracic cavity, vol. xiv, 1896, 477
œsophageal stricture, vol. xiii, 1895, 491
paranephric cysts, vol. viii, 1890, 265
prostatic surgery, vol. xx, 1902, 84
purulent peritonitis from typhoid, vol. xiii, 1895, 489
sarcoma of kidney, vol. xiii, 1895, 491
rubber tissue for meningeal adhesions, vol. xiii, 1895, 490
sinus pyæmia, vol. xiii, 1895, 490
tubercular peritonitis, vol. xiv, 1896, 117
Abdomen, laparotomy in gunshot wounds of, vol. v, 1887, 155
pistol-shot wound of, vol. v, 1887, 183, 193
Abdominal and pelvic drainage, vol. vi, 1888, 561
hysterectomy, vol. xx, 1902, 260
hysterectomy, morcellement and bisection of the uterus in complicated, vol. xx, 1902, 452
incisions, methods of closure of, vol. xviii, 1900, 308
operations, phlebitis following, vol. xix, 1901, 223
route for approaching rectal tumors, vol. xx, 1902, 474
surgery, technique of, vol. vii, 1889, 65
Abnormalities of cicatricial tissue, vol. xi, 1893, 41
Acetonæmia, fatal, following an operation for acute appendicitis, vol. xx, 1902, 271
Abscess cavities in the brain, vol. ii, 1884, 65
containing the micrococcus tetragenus, vol. vi, 1888, 549
hepatic, symptoms and treatment of, vol. xv, 1897, 225
of lung, pneumotomy for, vol. xix, 1901, 482
thyroid, vol. xii, 1894, 275

Acute suppurative pancreatitis, vol. xx, 1902, 219
Address on receiving the Gross statue, vol. xv, 1897, xxxviii
on the unveiling of Gross statue, vol. xv, 1897, xxxiv, xl
Adenocarcinomata of breast, vol. xvi, 1898, 144
Adhesions about the stomach, vol. xviii, 1900, 229
Agnew, D. Hayes, address of President, vol. vi, 1888, 1
medico-legal aspects of cranial and heart wounds, vol. v, 1887, 243
memorial wing of the University Hospital, Philadelphia, vol. xvi, 1898, xxxi
present status of brain surgery, based on the practice of Philadelphia surgeons, vol. ix, 1891, 15
remarks on his election, vol. v, 1887, xxiii
Air-embolism, experimental and clinical study of, vol. iii, 1885, 197
Air-passages, foreign bodies in, vol. i, 1881–83, 117
Alexander, S., etiology and classification of cystitis, vol. xvi, 1898, 50
Allen, Dudley P., appendicitis, vol. xvii, 1899, 108
cases of injury to the skull, vol. xvii, 1899, 230
effect of anæsthesia upon temperature and blood-pressure, vol. xiv, 1896, 367
fracture of femur, vol. xviii, 1900, 304
gastric surgery, vol. xviii, 1900, 238
indications for hysterectomy, vol. xv, 1897, 57
origin of appendicitis, vol. xv, 1897, 561
supravaginal hysterectomy, vol. xx, 1902, 483
teaching of surgery, vol. xx, 1902, 118
treatment of suppurative pericarditis, vol. xv, 1897, 152
tuberculosis of the mesenteric glands, vol. xviii, 1900, 332
Allis, Oscar H., a new method of pyloroplasty, vol. xx, 1902, 187, 190
amputation of the shoulder-joint, hemorrhage controlled by Wyeth's pin transfixing one flap, and elastic pressure, vol. xii, 1894, 71
ankylosis of metatarsophalangeal articulations suggested as preferable to amputation for the relief of deformed toes, vol. xiv, 1896, 479
demonstrations upon the cadaver illustrative of the various dislocations of the hip, vol. xviii, 1900, 355
fracture in the upper third of the femur below the trochanter minor, vol. ix, 1891, 329
fractures and disjunctures of the pelvis, their effect upon the genito-urinary tract and large pelvic bloodvessels, vol. viii, 1890, 273
fractures of pelvis from violence exerted through the long axis of the femur, being a comparative study of the relative strength of the neck of the femur and that of the pelvis when the violence is transmitted through the long axis of the former, vol. xix, 1901, 145
imperforate rectum, vol. xvii, 1899, 270
supravaginal hysterectomy, vol. xx, 1902 492
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 208
Ambulant treatment of fractures of lower extremity, vol. xiii, 1895, 479, vol. xiv, 1896, 239, 249, 254, 261, 264

American Surgical Association, report of the committee of the, on the medico-legal relations of the X-rays, vol. xviii, 1900, 429
Amputation at hip-joint, vol. xiii, 1895, 494
for relief of deformed toes, vol. xiv, 1896, 479
Amputations, shoulder, vol. xii, 1894, 35, 71
Anæsthesia, apparatus for massive infiltration, vol. xix
dangers and disadvantages of, vol. ii, 1884, 41
effect of, upon temperature and blood-pressure, vol. xiv, 1896, 367
influence of, on the surgery of the nineteenth century, vol. xv, 1897, 1
Anæsthetic, chloroform as an, vol. xiii, 1895, 177
ether as an, vol. xix, 1901, 72
Anæsthetics, experimental study of, vol. ii, 1884, 19
Anastomosis, intestinal, vol. xvii, 1899, 309
Anatomical and technical reasons why the perineal is preferable to the supra-pubic route in prostatic surgery, vol. xx, 1902, 59
Anatomy of oblique inguinal hernia, vol. xiii, 1895, 313
Aneurism, femoral, vol. v, 1887, 345
innominate, vol. vi, 1888, 439
of circle of Willis, vol. xiii, 1895, 494
of internal carotid artery, vol. iv, 1886, 233
of left subclavian artery, vol. v, 1887, 341
of posterior tibial artery, vol. i, 1881–83, 9
of right renal artery, nephrectomy for, vol. xviii, 1900, 272
popliteal, extirpation of, vol. xv, 1897, 199
radical cure of, based upon arteriorrhaphy, vol. xx, 1902, 396
triple and quadruple, vol. xiii, 1895, 401
Aneurisms, surgical treatment of, vol. xi, 1893, 115
traumatic arterio-venous, vol. xix, 1901, 237
Animal toxins, use of, in treatment of inoperable malignant tumors, vol. xvi, 1898, 104
Ankylosis of elbow-joint, vol. xi, 1893, 271
metatarsophalangeal articulations, vol. xiv, 1896, 477
of shoulder-joint, operative treatment of, vol. xiv, 1896, 409
of temporo-maxillary joint, vol. vii, 1889, 115
Ano-rectal imperforation, congenital, surgical treatment of, vol. xv, 1897, 452
Anterior dislocation of tibia treated by arthrotomy, vol. xix, 1901, 441
urethritis, vol. viii, 1890, 245
Anthrax, report of case of, vol. xi, 1893, 309
Antiseptic treatment of wounds, vol. i, 1881–1883, 137
Antistreptococcic serum, successful use of, vol. xix, 1901, 383
Anti-tubercular power of iodoform, vol. vii, 1889, 85
Aortic aneurisms, treatment of, by means of silver wire and electricity, vol. xix, 1901, 358
Apparently hopeless infiltration of left axilla and scapula by round-celled sarcoma, vol. xvi, 1898, 309
Appendicitis, vol. xiii, 1895, 508; vol. xvii, 1899, 72

Appendicitis, acute, fatal acetonæmia following an operation for, vol. xx, 1902, 271
acute, wound of the urinary tract during an operation for, vol. xvii, 1899, 215
case of, in which the appendix became permanently soldered to the bladder like a third ureter, producing a urinary fecal fistula, vol. xvii, 1898, 243
clinical value of blood examinations in, vol. xix, 1901, 60
hernia following operations for, vol. xvii, 1899, 190
operation during intervals of recurrent attacks of, vol. viii, 1890, 135
operations for, vol. xi, 1893, 265
origin of, vol. xv, 1897, 561
relapsing, vol. x, 1892, 179
some unusual cases of, vol. xvii, 1899, 199
treatment of, vol. xi, 1893, 253
Appendix vermiformis, carcinoma limited to, vol. xx, 1902, 228
vermiformis, removal of, vol. viii, 1890, 135
Arm, fractures of, vol. xii, 1894, 223
Armstrong, G. E., gastric surgery, vol. xviii, 1900, 244
Arteries, healing of, after ligature, vol. viii, 1885, 141
Arterio-venous aneurisms of the subclavian vessels, vol. xix, 1901, 237
Artery, subclavian, aneurism of the left, vol. v, 1887, 341
aneurism of posterior tibial, vol. i, 1881–83, 9
Arthrectomy of knee-joint, vol. viii, 1890, 257
Artificial anus, closure of, vol. xiii, 1895, 476
respiration, Fell's apparatus for, vol. xix, 1901, 383
respiration with a modified O'Dwyer tube, vol. xix, 1901, 392
urethra in prostatic obstruction, vol. vi, 1888, 349
Aseptic and antiseptic details in operative surgery, vol. ix, 1891, 94
and antiseptic management of wounds, vol. v, 1887, 349
operative technique, vol. ix, 1891, 485
wound treatment, Lister's system of, vol. i, 1881–83, 205
Ashhurst, John, Jr., a contribution to the study of excisions of the larger joints, vol. vi, 1888, 15
shoulder amputations, vol. xii, 1894, 75
surgical treatment of empyema, vol. xii, 1894, 11, 32
Association, past, present, and future of our, vol. ix, 1891, 1
Astragalus, dislocations of, vol. i, 1881–83, 265
Atmospheric purification, a device for, vol. iii, 1885, 387
Atonic dilatation of stomach, vol. xv, 1897, 283
Atresia, or defect of vagina, vol. v, 1887, 375
Auricular appendages, vol. xiii, 1895, 501

B

Bacillus coli communis, vol. xi, 1893, 215
Bacteria, culture of surgical, vol. iii, 1885, 193
of surgical diseases, vol. iv, 1886, 53

Barton, J. M., digital divulsion of the pylorus for cicatricial stenosis, vol. vii, 1889, 97
operations for appendicitis without removing the appendix, vol. xi, 1893, 265
splint for the treatment of synovitis of the wrist-joint, vol. i, 1881-83, 503.
Bell, James, gunshot wounds, vol. xx, 1902, 42
teaching of surgery, vol. xx, 1902, 126
Bellevue Hospital, vol. xiii, 1895, 461
Benign obstruction of pylorus, vol. xviii, 1900, 74
Bevan, Arthur Dean, a new method of pyloroplasty, vol. xx, 1902, 179, 188
post-operative hernia, vol. xix, 1901, 312
radical cure of aneurism, vol. xx, 1902, 432
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 205
the present status of the X-ray as a means of diagnosis and a therapeutic agent, vol. xx, 1902, 435, 451
traumatic arterio-venous aneurism, vol. xix, 1901, 293, 294
Bile-duct, remedial measures in obstruction of, vol. xvi, 1898, 206
Biliary passages, bending and valve-formation in, vol. xiv, 1896, 683
Billings, J. S., methods of teaching surgery, vol. xii, 1894, 77, 109
Bladder and prostate, removal of, for carcinoma through a suprapubic opening, vol. xx, 1902, 54
hernia of, vol. xiii, 1895, 321; vol. xviii, 1900, 257
removal of morbid growths from, vol. i, 1881–83, 505
removal of stone in, vol. xii, 1894, 239
stone in, removal of, vol. xv, 1897, 271
tuberculosis of, suprapubic drainage for, vol. xx, 1902, 67
tumors of, vol. viii, 1890, 21
Blake, J. B., studies of the blood in its relation to surgical diagnosis, vol. xix, 1901, 104
Blood changes induced by the administration of ether as an anæsthetic, vol. xix, 1901, 72
examination of, in relation to surgery of scientific but often of no practical value, and may misguide the surgeon, vol. xix, 1901, 115
examinations as an aid to surgical diagnosis, vol. xix, 1901, 122
examinations in appendicitis, clinical value of, vol. xix, 1901, 60
studies of, in its relation to surgical diagnosis, vol. xix, 1901, 104
Bloodgood, J. C., blood examinations as an aid to surgical diagnosis, vol. xix, 1901, 122
Bloodless operation for malignant polyp, vol. xi, 1893, 161
Blumer, George, the method employed in examining and recording pathological material, vol. xx, 1902, 142
Bone and joint tuberculosis, vol. ix, 1891, 287
Bone-drill, vol. xiii, 1895, 467
Bones, fixation of, new apparatus for, vol. xv, 1897, 251
Bontecou, R. B., external median perineal urethrotomy for cystitis and for the removal of morbid growths from the bladder, vol. i, 1881–83, 505
gunshot wounds, vol. xx, 1902, 42

Bony ankylosis of the hip-joint in bad position, vol. i, 1881–83, 111
Boston Society for Medical Improvement, Report of Committee of, vol. xviii, 1900, 370
Bradford, E. H., ambulatory treatment of fractures in children, vol. xiv, 1896, 249
arthrectomy of the knee-joint, vol. viii, 1890, 257
forcible correction, vol. xvii, 1899, 223
penetrating pistol-shot wounds of the skull, vol. ix, 1891, 433
restoration of joint function after fracture, vol. xiii, 1895, 223
subtrochanteric osteotomy for deformity following hip disease, vol. xix, 502
teno-plastic surgery, vol. xv, 1897, 89, 100
ulcer of stomach, proposed surgical treatment, vol. x, 1892, 219
Brain abscess, vol. xiii, 1895, 482
abscess cavities in, vol. ii, 1884, 65
human, operative surgery of, vol. iii, 1885, 1
probe, vol. xiii, 1895, 469
surgery, present status of, vol. ix, 1891, 15
Breast, adenocarcinomata of, vol. xvi, 1898, 144
cancer of, vol. xiii, 1895, 51; vol. xvi, 1898, 165
cancer of, treated at the Johns Hopkins Hospital since 1889, vol. xix, 1901, 26
carcinoma of, vol. ix, 1891, 219
female, tuberculosis of, vol. xiii, 1895, 498
sarcomata of, vol. v, 1887, 233
thorough removal of, vol. xix, 1901, 380
Breasts, diffuse fibroma of, with tendency to intra-canalicular growth of, vol. ix, 1891, 367
Brewer, George Emerson, fatal acetonæmia following an operation for acute appendicitis, vol. xx, 1902, 271, 283
pancreatitis, vol. xix, 1901, 172
teaching of surgery, vol. xx, 1902, 122
Briddon, C. K., carcinomatous glands, vol. xiii, 1895, 477
gastro-enterostomy, vol. xiii, 477
sarcoma of kidney, vol. xiii, 1895, 478
Briggs, William T., annual address, vol. iii, 1885, xxi.
remarks on his nomination for president, vol. ii, 1884, xxxvii
remarks on retirement, vol. iii, 1885, xxix
the antiseptic treatment of wounds after operations and injuries, vol. i, 1881–83, 137
the surgical treatment of epilepsy arising from injuries of the head, with special reference to the use of the trephine, vol. ii, 1884, 101
Brinton, John H., report of two cases of intra-uterine fracture, with remarks on this condition and references to fifty-one cases already reported by different writers, vol. ii, 1884, 425
British Medical Association, report of S. H. Weeks as delegate to, vol. xiv, 1896, 721

Bronchotomy through the chest-wall for foreign bodies impacted in the bronchi, vol. ix, 1891, 345
Brown, F. T., adenocarcinoma of breast, vol. xvi, 1898, 179
surgical crutch, vol. xiii, 1895, 483
Bryant, Joseph D., influence of mental depression on the development of malignant disease, vol. xix, 1901, 43
simple fractures of patella, vol. xvi, 1898, 92
surgical technique of entry to the posterior mediastinum, vol. xiii, 1895, 443
teaching of surgery, with special reference to the didactic method, vol. xx, 1902, 104
Bull, W. T., gastro-enterostomy, vol. xiii, 1895, 492
on the radical cure of hernia, with results of one hundred and thirty-four operations, vol. viii, 1890, 99
on the surgical management of typhlitis and perityphlitis, vol. vi, 1888, 389
pedicle flaps in plastic surgery, vol. xiii, 1895, 492
Bullet wounds of intraperitoneal viscera, vol. xx, 1902, 13
Burrell, Herbert L., gunshot injuries of spine, vol. xvi, 1898, 285, 289
habitual or recurrent dislocation of shoulder, vol. xv, 1897, 293
ligature of innominate artery, vol. xiii, 1895, 291
report of a case of anthrax, vol. xi, 1893, 309
surgery of the Spanish war, vol. xvii, 1899, 64, 69
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 205
teaching of surgery, vol. xx, 1902, 86
Byrd, William A., trephining for insanity consequent upon a depressed fracture of the skull, vol. ii, 1884, 125

C

Cabell, James L., on sanitary conditions in relation to the treatment of surgical operations and injuries, vol. i, 1881–83, 23
Cabot, A. T., adhesions about stomach, vol. xviii, 1900, 229
ambulatory treatment of fractures, vol. xiv, 1896, 265
ankylosis of the temporomaxillary joint relieved by osteotomy of the neck of the inferior maxilla, vol. vii, 1889, 115
cases of operation in spina bifida and encephalocele, vol. x, 1892, 163
discussion of hernia, vol. xiii, 1895, 344
question of castration for enlarged prostate, vol. xiv, 1896, 189, 238
Cabot, R. C., studies of the blood in its relation to surgical diagnosis, vol. xix, 1901, 104
Cadaver, demonstrations upon, illustrative of the various dislocations of the hip, vol. xviii, 1900, 355
Cæcum, tumor of, causing intussusception, vol. x, 1892, 205
Calculi, prostatic, vol. ii, 1884, 143
Calculus, renal, vol. xix, 1901, 377
Campbell, Henry F., strictures of œsophagus, vol. i, 1881–83, 517

Cancer, an inquiry into the etiology of, vol. xvi, 1898, 182
cause of, vol. xix, 1901, 57
epithelial, of tongue and fauces, removal of, vol. vii, 1889, 187
of breast, vol. xvi, 1898, 165
of breast treated at the Johns Hopkins Hospital since 1889, vol. xix, 1901, 26
of breast, treatment of, vol. xiii, 1895, 51
of floor of mouth, vol. xiii, 1895
of lip, vol. xiii, 1895, 45
of male genitals, vol. xiii, 1895, 63
of penis, vol. xiii, 1895, 63
of pharynx, vol. xiii, 1895, 50
of prostate, vol. xiii, 1895, 72
of right kidney, nephrectomy for removal of, vol. vii, 1889, 157
of scrotum, vol. xiii, 1895, 68
of stomach, diagnosis of, vol. xviii, 1900, 138
of tongue, vol. xiii, 1895, 46
operative treatment of, vol. xiii, 1895, 35, 45
recent Buffalo investigations regarding nature of, vol. xix, 1901, 1
rectal, vol. xiii, 1895, 77
Carcinoma limited to the appendix vermiformis, vol. xx, 1902, 228
nephrectomy for medullary, vol. i, 1881–83, 461
of breast, vol. ix, 1891, 219
of cæcum simulating appendicitis, vol. xiii, 1895, 482
of lip, spontaneous disappearance of, vol. xviii, 1900, 302
of rectum, vol. xviii, 1900, 289
of testicle, vol. xiii, 1895, 69
of uterus, early signs of, vol. xix, 1901, 24
Carcinomatous glands, vol. xiii, 1895, 477
Caries, spinal, vol. xvii, 1899, 223
Carmalt, W. H., castration in hypertrophy of prostate, vol. xiii, 1895, 169
conditions demanding excision of the globe of the eye, vol. x, 1892, 137
extirpation of the larynx, vol. xii, 1894, 267
gunshot injuries of spine, vol. xvi, 1898, 288
kidney and urethral surgery, vol. xii, 1894, 177
restoration of joint function after fracture, vol. xiii, 1895, 207
surgery of the gall-bladder, vol. xi, 1893, 107
surgical treatment of empyema, vol. xii, 1894, 27
thorough removal of breast, vol. xix, 1901, 382
treatment of cancer, vol. xiii, 1895, 100
Carotid arteries, ligation of, vol. vi, 1888, 439; vol. vii, 1889, 187
artery, traumatic aneurism of, vol. iv, 1886, 233
Carpus, dislocations of, vol. ix, 1891, 465
Carson, N. B., appendicitis, vol. xvii, 1899, 113
appendicitis with urinary fistula, vol. xvi, 1898, 252
complete absence of uterus and vagina, with creation of new vagina, vol. xviii, 1900, 339

Carson, N. B., cranial cracked-pot sound as a symptom of cerebellar tumors, vol. xvi, 1898, 234, 242
gunshot injuries of spine, vol. xvi, 1898, 286, 288
gunshot wounds, vol. xx, 1902, 40
methods of closure of abdominal incisions, vol. xviii, 1900, 323
pancreatitis, vol. xix, 1901, 180
removal of seminal vesicle, vol. xviii, 1900, 334
supravaginal hysterectomy, vol. xx, 1902, 488
surgery of the Spanish war, vol. xvii, 1899, 69
Cartilages, semilunar, dislocations and injuries of, vol. xi, 1893, 289
Case, emergency, vol. viii, 1890, 231
Castration, question of, for enlarged prostate, vol. xiv, 1896, 189
results of double, in hypertrophy of prostate, vol. xiii, 1895, 103
Catheter, an improved, vol. xx, 1902, 496
Catheterization of ureters in the male, vol. xix, 1901, 218
Celluloid plate in skull, vol. xiii, 1895, 488
testicles, vol. xiii, 1895, 488
Cephalhydrocele, traumatic, vol. ii, 1884, 55
Cerebral abscess, surgical interference in, vol. ii, 1884, 85
surgery, vol. vi, 1888, 293
tumor, vol. x, 1892, 1893
Cervical vertebra, fifth, dislocation of, vol. xvii, 1899, 211
Cheever, David W., address of president, vol. vii, 1889, 1
lupus of tongue, vol. viii, 1890, 225
retropharyngeal sarcoma removed by an external incision through the neck, vol. viii, 1890, 227
sarcoma of tonsil, vol. vii, 1889, 57
shock, vol. vi, 1888, 533
some cases not operable, vol. xvi, 1898, 306
some of the dangers and disadvantages of anæsthesia, vol. ii, 1884, 41
Chiene, John, remarks on the present status of brain surgery, vol. ix, 1891, 32
teaching of surgery, vol. xii, 1894, 89
Chloroform as an anæsthetic, vol. xiii, 1895, 177
narcosis, puncture of heart in, vol. v, 1887, 275
Choice between the suprapubic and the infrapubic methods of reaching tumors and other surgical lesions of the pelvic organs, vol. xx, 1902, 471
Cholecystectomy, vol. xiii, 1895, 347
for impacted gall-stones, vol. xi, 1893, 363
partial, vol. i, 1881–83, 461
Cholecystotomy, vol. iii, 1885, 335; vol. iv, 1886, 297
by the lumbar incision, vol. vii, 1889, 217
Cicatricial stenosis, digital divulsion of the pylorus for, vol. vii, 1889, 97
stricture of œsophagus, vol. xix, 1901, 450
tissue, abnormalities of, vol. xi, 1893, 41
Cicatrization in bloodvessels after ligature, vol. ii, 1884, 249

Circulus vitiosus following gastro-enterostomy, vol. xx, 1902, 335
Circumstances under which chloroform is preferable to ether as an anæsthetic, vol. xiii, 1895, 177
Classification of tumors, report of committee on, vol. xiv, 1896, 719
of vesical calculi for operation, vol. v, 1887, 79
Climate and operative surgery, vol. xv, 1897, 189
Clinics, hospital, vol. xiii, 1895, 461
Closure of the jaws, vol. i, 1881–83, 469
Club-foot, vol. xiv, 1896, 716
pathology and treatment of, vol. viii, 1890, 71
Coccygeal angiofibromata, multiple, vol. xviii, 1900, 305
Coccygectomy, results of, vol. xv, 1897, 452
Coleman, John S., the multiple wedge principle in the treatment of organic strictures of the urethra, vol. ii, 1884, 173
Coley, W. B., influence of the Roentgen ray upon the different varieties of sarcoma, vol. xx, 1902, 308, 334
methods of closure of abdominal incisions, vol. xviii, 1900, 322
radical cure of inguinal and femoral hernia, vol. xix, 1901, 337, 358
radical cure of umbilical hernia, vol. xix, 1901, 305
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 208
treatment of inoperable malignant tumors with the toxins of erysipelas and the bacillus prodigiosus, vol. xii, 1894, 183, 211
treatment of inoperable sarcoma with the mixed toxins of erysipelas and bacillus prodigiosus, vol. xix, 1901, 27
Colles' fracture, luxation of ulna in, vol. i, 1881–83, 551
fracture, shortening of radius in, vol. xx, 1902, 378
Colored races, diseases in, vol. v, 1887, 261
Comingor, J. A., hypertrophy of prostate, vol. viii, 1890, 215
Compound ganglion, treatment of, vol. ii, 1884, 521
Congenital ano-rectal imperforation, surgical treatment of, vol. xv, 1897, 452
deficiency of fingers, vol. xiv, 1896, 717
œsophageal pouch, vol. xiii, 1895, 357
subspinous dislocation of head of humerus, vol. xiii, 1895, 385
Conner, Phineas S., address of the president, vol. x, 1892, 1
appendicitis, vol. xvii, 1899, 107
cure of facial neuralgia, vol. xiv, 1896, 50
excisions of tarsus, with a report of two successful removals of the entire tarsus, vol. i, 1881–83, 285
Gunshot injuries of spine, vol. xvi, 1898, 287
mooted points as to fracture of the arm, vol. xii, 1894, 236
operative treatment of cancer in various localities, vol. xiii, 1895, 45
Roentgen rays in surgery, vol. xv, 1897, 88
surgery of hypertrophied prostate, vol. xi, 1893, 207, 210
surgery of the Spanish war, vol. xvii, 1899, 57, 66, 68
surgical treatment of aneurisms, vol. xi, 1893, 125
surgical treatment of tumors of the bladder, vol. viii, 1890, 21

Conner, Phineas S., teaching of surgery, vol. xii, 1894, 104
the etiology of traumatic tetanus, vol. iii, 1885, 315
traumatic cephalhydrocele, vol. ii, 1884, 55
Continuous fever, late, due to staphylococcus blood infection, vol. xix, 1901, 383
Correction, forcible, vol. xvii, 1899, 223
Cranial and heart wounds, vol. v, 1887, 243
Cranial cracked-pot sound as a symptom of cerebellar tumors, vol. xvi, 1898, 234
Croup, tracheotomy and intubation in treatment of, vol. vi, 1888, 443
tracheotomy in, vol. ii, 1884, 381
Cullen, T. S., cause of cancer, vol. xix, 1901, 57
early signs of carcinoma of uterus, vol. xix, 1901, 24
Culture of surgical bacteria, vol. iii, 1885, 193
Curtis, B. F., appendicitis, vol. xvii, 1899, 112
blood examinations as an aid in surgical diagnosis, vol. xix, 1901, 143
surgical treatment of simple dilatation of stomach and gastroptosis, vol. xviii, 1900, 124
Curvilinear prerectal operation for prostatic abscess, vol. xx, 1902, 353
Cushing, H. W., method of treatment for the restoration of entire tibiæ necrotic from acute osteomyelitis, vol. xvii, 1899, 272
right-angle continuous intestinal suture, vol. xvii, 1899, 297
traumatic rupture of pancreas, vol. xvi, 1898, 215
Cyst of pancreas, vol. vi, 1888, 557
retroperitoneal, vol. x, 1892, 211
Cystic growth in femur, vol. xi, 1893, 329
pelvic tumor, vol. xviii, 1900, 345
Cystitis, etiology and classification of, vol. xvi, 1898, 6
external median perineal urethrotomy for, vol. i, 1881–83, 505
Cystostomy, suprapubic, vol. x, 1892, 235
Cystotomy for stone, intraperitoneal suprapubic, vol. xiii, 1895, 433
operation of suprapubic, vol. vi, 1888, 361
suprapubic, vol. v, 1887, 9, 29; vol. viii, 1890, 235
Cysts in connection with the teeth, vol. xx, 1902, 383
paranephric, vol. viii, 1890, 265

D

Da Costa, J. C., Jr., clinical value of blood examinations in appendicitis, vol. xix, 1901, 60
Da Costa, John Chalmers, blood changes induced by the administration of ether as an anæsthetic, vol. xix, 1901, 72
teaching of surgery, vol. xx, 1902, 120
Dandridge, N. P., ambulatory treatment of fractures of leg, vol. xiv, 1896, 261
cure of facial neuralgia, vol. xiv, 1896, 46

Dandridge, N. P., effect of erysipelas upon sarcoma, vol. xii, 1894, 209
nerve stretching, vol. vi, 1888, 491
parosteal sarcoma of femur, vol. xiv, 1896, 454
prostatic surgery, vol xx, 1902, 76
surgery of tongue, vol. x, 1892, 101
Dangers and disadvantages of anæsthesia, vol. ii, 1884, 41
Deaver, J. B., abdominal hysterectomy, vol. xx, 1902, 260
acute appendicitis, vol. xx, 1902, 282
appendicitis, vol. xvii, 1899, 99
carcinoma of rectum, vol. xviii, 1900, 289
examination of blood in relation to surgery of scientific but often of no practical value, and may misguide the surgeon, vol. xix, 1900, 115
influence of ether narcosis upon genito-urinary tract, vol. xiii, 1895, 197
kidney and urethral surgery, vol. xii, 1894, 176
methods of closure of abdominal incisions, vol. xviii, 1900, 318
recto-urethral fistula following fracture of the pelvis, vol. x, 1892, 241
treatment of appendicitis, vol. xi, 1893, 253
treatment of urethral vegetations by means of a circular cutting curette, vol. xii, 1894, 295
Deformed toes, amputation for relief of, vol. xiv, 1896, 479
Degeneration, malignant, of ulcers of leg, vol. ii, 1884, 491
Dennis, Frederic S., a report of some interesting cases of cerebral tumor, vol. x, 1892, 183
address of president, vol. xiii, 1895, 1
closure of artificial anus, vol. xiii, 1895, 476
excision of hip, vol. xiii, 1895, 476
gunshot injuries of spine, vol. xvi, 1898, 287
multiple sarcomata, vol. xiii, 1895, 475
new method of fixation of fractures, vol. xi, 1893, 32
recurrence of carcinoma of the breast, vol. ix, 1891, 219
stricture of œsophagus following typhoid fever, vol. xviii, 1900, 232
subperiosteal excision of bone, vol. xiii, 1895, 475
suprapubic cystotomy, its technique illustrated by anatomical preparations, vol. v, 1887, 9
the propriety of the removal of the appendix vermiformis during the intervals of recurrent attacks of appendicitis, vol. viii, 1890, 135
Description of a rectal obturator, vol. i, 1881–83, 509
Diagnostitial laparotomy, vol. iv, 1886, 15
Diaphragm, traumatic rupture of, vol. xviii, 1900, 246
Diffuse fibroma of breasts, vol. ix, 1891, 367
Digital divulsion of the pylorus, vol. vii, 1889, 97
Dilatation of stomach, surgical treatment of, vol. xviii, 1900, 124
Diploe, venous tumor of, vol. xii, 1894, 283
Diseases in white and colored races, vol. v, 1887, 261
Disinfection of hands, vol. xvii, 1899, 116

Dislocation, double, of jaw, vol. xiv, 1896, 455
of extensor tendon of middle finger, vol. xiii, 1895, 499
of ulnar nerve at elbow, vol. xiii, 1895, 281
Dislocations, manipulation in reduction of hip and shoulder, vol. ii, 1884, 399
of astragalus, vol. i, 1881–83, 265
of carpus, vol. ix, 1891, 465
of elbow, vol. ix, 1891, 453
of hip, vol. xviii, 1900, 355
upward, of hip, vol. ix, 1892, 157
Displacement of ulnar nerve at elbow, vol. xiii, 1895, 375
Division or resection in the neck of the pneumogastric and phrenic nerves, vol. xiii, 1895, 253
Dogs, mad, personal experience with, vol. xiii, 1895, 351
Drainage in bullet wounds of intraperitoneal viscera, vol. xx, 1902, 13
in the treatment of wounds, vol. vii, 1889, 73
pelvic and abdominal, vol. vi, 1888, 561
Dunott, T. J., some remarks on hypertrophy of the tongue, otherwise known as lingua vituli, lingua propendulæ, and macroglossia, vol. v, 1887, 311
Duodenum, perforating ulcer of, vol. xviii, 1900, 1

E

Effects of modern small-arm projectiles, vol. xvii, 1899, 43
Elbow, dislocation of, operation for, vol. xiii, 1895, 489
dislocation of ulnar nerve at, vol. xiii, 1895, 281
old, unreduced dislocations of, vol. ix, 1891, 453
Elbow-joint, ankylosis of, vol. xi, 1893, 271
fractures of bones of, vol. ix, 1891, 393
Electrolysis and cataphoresis combined with the internal use of Donovan's solution in treatment of sarcoma, vol. xv, 1897, 177
Eliot, Ellsworth, radical cure of aneurism, vol. xx, 1902, 432
supravaginal hysterectomy, vol. xx, 1902, 489
teaching of surgery, vol. xx, 1902, 116
Elliot, John Wheelock, gunshot wounds, vol. xx, 1902, 49
immediate suture of the gall-ducts and the gall-bladder after extraction of stones, vol. xiii, 1895, 361
pancreatitis, vol. xix, 1901, 178
prostatic surgery, vol. xx, 1902, 77
strangulation of Meckel's diverticulum caused by volvulus of the ileum, vol. xii, 1894, 217, 222
successful laparotomy and Kraske operation for abscess of rectum in an infant two days old, vol. xiv, 1896, 461
successful removal of acutely inflamed tubercular mesenteric glands, vol. xviii, 1900, 264
supravaginal hysterectomy, vol. xx, 1902, 481

Elting, Arthur W., carcinoma limited to the appendix vermiformis, vol. xx, 1902, 257
remarks on the method of keeping histories of surgical patients in the Albany Hospital, vol. xx, 1902, 148
surgical treatment of tumor of liver, vol. xv, 1897, 257
Emergency case, vol. viii, 1890, 231
Empyema, surgical treatment of, vol. xii, 1894, 11
use of trephine in traumatic, vol. i, 1881–83, 241
Encephalocele and spina bifida, vol. x, 1892, 163
Enterectomy for sarcoma of the mesenteric, vol. x, 1892, 193
Epilepsy, surgical treatment of, vol. ii, 1884, 101
Epiphyseal separation of head of femur, vol. xv, 1897, 215
separation of lower end of femur, vol. xiii, 1895, 389
Epithelioma of hand, vol. viii, 1890, 65
of tonsil, vol. xiii, 1895, 505
Ernst, Harold C., a consideration of the bacteria of surgical diseases, vol. iv, 1886, 53
the culture of surgical bacteria, vol. iii, 1885, 193
Essentials of modern hospital construction, vol. xx, 1902, 130, 138, 142, 143, 148
Estes, W. L., gunshot wounds, vol. xx, 1902, 44
gunshot wounds in civil practice, vol. xvii, 1899, 245
pancreatitis, vol. xix, 1901, 181
supravaginal hysterectomy, vol. xx, 1902, 491
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 450
Ether as an anæsthetic, vol. xiii, 1895, 177
as an anæsthetic, blood changes induced by the administration of, vol. xix, 1901, 72
influence of, upon kidneys, vol. xiii, 1895, 189
narcosis, influence of, upon genito-urinary tract, vol. xiii, 1895, 197
Etiology of traumatic tetanus, vol. iii, 1885, 315
Eve, D., healing by first intention, vol. xvii, 1899, 149
Excision of a part of three ribs and a portion of diaphragm for sarcoma, vol. xix, 1901, 494
of globe of eye, vol. x, 1892, 137
of hip, vol. xiii, 1895, 461, 476
of rectum for cancer, vol. xiii, 1895, 487
of tarsus, vol. i, 1881–83, 285
of the lumbar lymphatic nodes and spermatic vein in malignant disease of the testicle, 1902, vol. xx, 12, 297
of tuberculous seminal vesical with castration, vol. xiii, 1895, 486
of varicose veins, vol. xii, 1894, 289
Excisions of the larger joints, vol. vi, 1888, 15
Exhibition of methods of medical instruction in Johns Hopkins Medical School and Hospital, vol. xix, 1901, 216
Exophthalmic goitre treated by operation, vol. xx, 1902, 285

Experimental and clinical study of air-embolism, vol. iii, 1885, 197
researches on cicatrization in bloodvessels after ligature, vol. ii, 1884, 249
study of anæsthetics, vol. ii, 1884, 19
External median perineal urethrotomy, vol. i, 1881–83, 505
Extirpation of entire tongue for cancerous affections, vol. ii, 1884, 445
of popliteal aneurism, vol. xv, 1897, 199
of the larynx, vol. xii, 1894, 267
Extra-uterine pregnancy and pelvic hemorrhage, vol. xii, 1894, 299
Eye, excision of globe of, vol. x, 1892, 137

F

Facial nerve, stretching of, vol. iv, 1886, 275
neuralgia, intracranial operations for cure of, vol. xiv, 1896, 1
Fallopian tube, hernia of, vol. x, 1892, 171
Fatal acetonæmia following an operation for acute appendicitis, vol. xx, 1902, 271
Fecal communication, case of, with the bladder, with resulting calculus, following appendicitis, vol. xvi, 1898, 253
Fell's apparatus for artificial respiration, vol. xix, 1901, 383
Femoral aneurism, vol. v, 1887, 345
artery, ligation of common, vol. ii, 1884, 237
artery, traumatic aneurism of, vol. i, 1881–83, 453
head, separation of, vol. xiii, 1895, 502
Femur, cystic growth in, vol. xi, 1893, 329
epiphyseal separation of head of, vol. xv, 1897, 215
epiphyseal separation of lower end of, vol. xiii, 1895, 389
fracture of, vol. xviii, 1900, 299
fracture of neck of, vol. i, 1881–83, 453
fracture of shaft of, vol. ix, 1891, 81
fracture of upper third of, vol. ix, 1891, 329
fractures of shaft of, vol. viii, 1890, 39
intra-capsular fracture of neck of, vol. i, 1881–83, 167
parosteal sarcoma of, vol. xiv, 1896, 443
Fenger, Christian, a new kolpoplastic operation for atresia or defect of the vagina, vol. v, 1887, 375
ambulatory treatment of fractures, vol. xiv, 1896, 267
appendicitis, vol. xvii, 1899, 102
cure of facial neuralgia, vol. xiv, 1896, 47
effect of anæsthesia, vol. xiv, 1896, 387
hernia of bladder met with during operations for inguinal and femoral hernia, vol. xiii, 1895, 321
on opening and drainage of abscess cavities in the brain, vol. ii, 1884, 65
retention from displacement, bending, and valve-formation in the biliary tract, vol. xiv, 1896, 683
Roentgen rays in surgery, vol. xv, 1897, 87

Fenger, Christian, strangulation of Meckel's diverticulum, vol. xii, 1894, 221
surgery of the ureter, vol. xii, 1894, 129, 180
surgical treatment of empyema, vol. xii, 1894, 25
surgical treatment of tuberculosis, vol. xiv, 1896, 184
traumatic lesions of kidney, vol. xiv, 1896, 350
treatment of cancer, vol. xiii, 1895, 98
Fibroid tumors of uterus, vol. x, 1892, 79
Fibroma, diffuse, of breasts, vol. ix, 1891, 367
intra-cranial, removal of, vol. vi, 1888, 293
Finger, glass in, vol. xiv, 1896, 717
Fingers, congenital deficiency of, vol. xiv, 1896, 717
Finney, J. M. T., a new method of pyloroplasty, vol. xx, 1902, 165, 188
double renal calculus, vol. xix, 1901, 379
gunshot wounds, vol. xx, 1902, 50
perforating ulcer of stomach, vol. xviii, 1900, 58
prostatic surgery, vol. xx, 1902, 82
silver filigree for hernial apertures, vol. xx, 1902, 373
treatment of aortic aneurism, vol. xix, 1901, 373
First-aid package in military surgery, vol. xvii, 1899, 16
Fischer, C. S., observations on gastric functions before and after gastro-enterostomy, vol. xviii, 1900, 207
Fixation of bones after resection, new apparatus for, vol. xv, 1897, 251
Floating kidney containing three dermoid cysts and several serous cysts, vol. xv, 1897, 591
kidney, distended gall-bladder simulating, vol. vii, 1889, 217
Fluhrer, W. F., bone-drill, vol. xiii, 1895, 467
brain-probe, vol. xiii, 1895, 469
urethrotome, vol. xiii, 1895, 468
Forbes, W. S., extirpation of larynx, vol. xii, 1894, 273
indigo calculus from the kidney, vol. xii, 1894, 265
kidney and urethral surgery, vol. xii, 1894, 176
removal of stone in bladder, vol. xv, 1897, 271
stone in bladder, vol. xii, 1894, 239
teaching of surgery, vol. xii, 1894, 106
Forceps, demonstration of new, vol. xvii, 1899, 309
Forcible correction, vol. xvii, 1899, 223
Foreign bodies in the air-passages, vol. i, 1881–83, 117
body impacted in larynx, vol. x, 1892, 231
Forward dislocation of the fifth cervical vertebra, vol. xvii, 1899, 211
Fowler, George R., abnormalities in cicatricial tissue, vol. xi, 1893, 71
aseptic operative technique, vol. ix, 1891, 485
auricular appendages, vol. xiii, 1895, 501
case of fecal communication with the bladder, with resulting calculus, following appendicitis, vol. xvi, 1898, 253
cure of facial neuralgia, vol. xiv, 1896, 43, 48, 50

Fowler, George R., dislocation of extensor tendon of middle finger, vol. xiii, 1895, 499
improved method of exploring thoracic cavity, vol. xiv, 1896, 478
intracranial neurectomy by Krause-Hartley method, vol. xiii, 1895, 500
methods of closure of abdominal incisions, vol. xviii, 1900, 319
observations upon the organization and equipment of military field hospitals in the volunteer army, vol. xvii, 1899, 29, 71
pancreatitis, vol. xix, 1901, 179
phlebitis following abdominal operations, vol. xix, 1901, 234
removal of Gasserian ganglion, vol. xv, 1897, 176
Roentgen rays in surgery, vol. xv, 1897, 82
rupture of both quadriceps extensor tendons at the patellar attachment, vol. xiii, 1895, 501
shortening of the radius in Colles' fracture, vol. xx, 1902, 378
strangulation of Meckel's diverticulum, vol. xii, 1894, 221
surgery of intrathoracic tuberculosis, vol. xiv, 1896, 129, 186
suture of tendo-Achillis, vol. xiii, 1895, 500
the circulus vitiosus following gastro-enterostomy, vol. xx, 1902, 335
treatment of suppurative pericarditis, vol. xv, 1897, 153
use of animal toxins in treatment of inoperable malignant tumors, vol. xvi, 1898, 104
Fracture, intra-uterine, vol. ii, 1884, 425
of humerus with dislocation, vol. xii, 1894, 287
of lower end of radius, vol. xiv, 1896, 611
of neck of femur, vol. i, 1881–83, 167, 313, 333
of patella, vol. xiii, 1895, 465; vol. xviii, 1900, 341
of patella, transverse, vol. i, 1881–83, 99
of pelvis, vol. xiii, 1895, 503
of pelvis, recto-urethral fistula following, vol. x, 1892, 241
of shaft of the femur, vol. ix, 1891, 81
of upper third of femur, vol. ix, 1891, 329
Fractures and disjunctures of the pelvis, vol. viii, 1890, 273
and dislocations of spine, vol. xix, 1901, 314
irreducible subcutaneous, operative treatment of, vol. xv, 1897, 203
new method of fixation of, vol. xi, 1893, 1
of arm, vol. xii, 1894, 223
of base of radius, vol. x, 1892, 29
of bones of elbow-joint, vol. ix, 1891, 393
of humerus involving elbow-joint, vol. ix, 1891, 261
of lower end of humerus, vol. x, 1892, 15
of lower extremity, ambulatory treatment of, vol. xiv, 1896, 239, 249, 254, 261, 264
of patella, vol. xvi, 1898, 53
of pelvis, vol. xix, 1901, 145
of shaft of femur, vol. viii, 1890, 39
of skull, vol. i, 1881–83, 83
Freeman, L., healing by first intention, vol. xvii, 1899, 143

FREEMAN, L., methods of closure of abdominal incisions, vol. xviii, 1900, 322
pancreatitis, vol. xix, 1901, 182
traumatic diaphragmatic hernia, vol. xviii, 1900, 255
treatment of aortic aneurisms by means of silver wire and electricity, vol. xix, 1901, 359, 375
union following pathological fracture of femur due to secondary carcinoma, vol. xviii, 1900, 299, 304
FRESE, C., influence of ether narcosis upon genito-urinary tract, vol. xiii, 1895, 197
Future of surgery without limit, vol. vii, 1889, 1

G

Gall-bladder and appendix, resemblances in function between, vol. xx, 1902, 374
simulating floating kidney, vol. vii, 1889, 217
surgery of, vol. xi, 1893, 81
Gall-duct, suture of, vol. xiii, 1895, 481
Gall-ducts, immediate suture of, after extraction of stones, vol. xiii, 1895, 361
Gall-stones, cholecystectomy for, vol. xi, 1893, 363
Gangrenous hernia, surgical treatment of, vol. vii, 1889, 191
Gasserian ganglion, removal of, vol. xv, 1897, 171
GASTON, J. McF., adenocarcinoma of breast, vol. xvi, 1898, 180
castration for enlarged prostate, vol. xiv, 1896, 236
effect of erysipelas upon sarcoma, vol. xii, 1894, 211
improved method of exploring the thoracic cavity, vol. xiv, 1896, 465
kidney and urethral surgery, vol. xii, 1894, 177
lymphangitis accompanied with blood-poisoning and followed by multiple abscess, vol. xi, 1893, 299
mooted points as to fractures of arm, with notice of improved splint, vol. xii, 1894, 223, 238
parosteal sarcoma of femur, vol. xiv, 1896, 454
remedial measures in obstruction of the common bile-duct, vol. xvi, 1898, 206
surgical infection, vol. xiv, 1896, 290
surgical treatment of empyema, vol. xii, 1894, 31
surgical treatment of tuberculosis, vol. xiv, 1896, 176
treatment of sarcoma by electrolysis and cataphoresis combined with the internal use of Donovan's solution, vol. xv, 1897, 177
treatment of suppurative pericarditis, vol. xv, 1897, 149
Gastric dilatation, gastrorrhaphy for, vol. x, 1892, 149
functions, observations on, before and after gastro-enterostomy, vol. xviii, 1900, 207
ulcer, non-perforating hemorrhage, vol. xviii, 1900, 38
Gastro-enterostomy, vol. xiii, 1895, 477, 492
complications following, vol. xx, 1902, 151

Gastro-enterostomy, in chronic diseases of stomach, vol. xviii, 1900, 207
vicious circle after, vol. xix, 1901, 417
vomiting following, vol. xx, 1902, 335
Gastroptosis, vol. xviii, 1900, 124
Gastrorrhaphy, vol. xv, 1897, 283
for diminishing a dilated stomach, vol. x, 1892, 149
Gastrostomy in stricture of œsophagus following typhoid fever, vol. xviii, 1900, 232
Gay, G. W., ambulatory treatment of fractures, vol. xiv, 1896, 268
circumstances under which chloroform is preferable to ether as an anæsthetic, vol. xiii, 1895, 177
effect of anæsthesia, vol. xiv, 1896, 386, 387
surgical treatment of tuberculosis, vol. xiv, 1896, 181
the comparative merits of tracheotomy and intubation in the treatment of croup, vol. vi, 1888, 443
tracheotomy in croup, vol. ii, 1884, 381
Generative organs, female, cancer of, vol. xiii, 1895, 35
Genital organs, female, tuberculosis of, vol. xiv, 1896, 93
organs, male, tuberculosis of, vol. xiv, 1896, 53
Genitals, male, cancer of, vol. xiii, 1895, 63
Genito-urinary tract, influence of ether narcosis upon, vol. xiii, 1895, 197
Gerrish, Frederic Henry, adenocarcinomata of breast, vol. xvi, 1898, 163
radical cure of umbilical hernia, vol. xix, 1901, 304
suprapubic cystotomy, its frequent utility and an appliance for preventing the chief annoyance attending a permanent opening in the bladder, vol. x, 1892, 235
surgery of hypertrophied prostate, vol. xi, 1893, 206
the relations of the lymphatic system to the various regions, vol. xiii, 1895, 31
Gerster, Arpad G., a contribution to the surgery of the rectum, vol. xi, 1893, 129, 157
aseptic and antiseptic details in operative surgery, vol. ix, 1891, 94
bloodless operation for malignant polyp, vol. xi, 1893, 164
carcinoma limited to the appendix vermiformis, vol. xx, 1902, 258
castration in hypertrophy of prostate, vol. xiii, 1895, 167
excision of tuberculous seminal vesicle with castration, vol. xiii, 1895, 486
heteroplasty for defect of skull, vol. xiii, 1895, 485
influence of the Roentgen ray on sarcoma, vol. xx, 1902, 333
modern operative treatment of rectal cancer, vol. xiii, 1895, 77, 101
osteoplastic repair of a total defect of shaft of tibia, vol. xiii, 1895, 485
radical cure of aneurism, vol. xx, 1902, 431
removal of a tubercular tumor of the larynx by laryngo-pharyngotomy, with demonstration of cases, vol. viii, 1890, 281
resection of rectum for cancer, vol. xiii, 1895, 487
Giant sacrococcygeal tumors, vol. xix, 1901, 444

Gibbes, Heneage, rare form of epithelioma of the hand, vol. viii, 1890, 65
Glass in finger, vol. xiv, 1896, 717
Globe of eye, excision of, vol. x, 1892, 137
Goitre, exophthalmic, treated by operation, vol. xx, 1902, 285
Gouley, John W. S., some points in the surgery of the hypertrophied prostate, vol. iii, 1885, 163
Gregory, E. H., neoplasms from a practical point of view, vol. ii, 1884, 501
Gross statue, vol. xv, 1897, xxxi
Gross, S. D., address of welcome, vol. i, 1881–83, xxi, xxix
remarks on his nomination for president, vol. i, 1881–83, xxiii
valedictory address, vol. i, 1881–83, xxxi
value of early operation in morbid growths, vol. i, 1881–83, 253
wounds of the intestines, vol. ii, 1884, i
Gross, Samuel W., a case of nephrectomy for medullary carcinoma, and partial cholecystectomy for calculus in the same subject, vol. i, 1881–83, 461
gastrostomy, œsophagostomy, internal œsophagotomy, combined œsophagotomy, œsophagectomy, and retrograde divulsion in the treatment of stricture of the œsophagus, vol. ii, 1884, 363
influence of operations upon the prolongation of life and permanent recovery in carcinoma of the breast, vol. i, 1881–83, 1
nephrectomy, its indications and contraindications, vol. iii, 1885, 109
the prognosis of sarcomata of the breast, vol. v, 1887, 233
Growths, malignant, early diagnosis of, vol. vii, 1889, 9
nasopharyngeal or retropharyngeal, vol. xi, 1893, 245
Gunn, Moses, address of president, vol. iv, 1886, 1
remarks on election as president, vol. iii, 1885, xxix
the philosophy of manipulation in the reduction of hip and shoulder dislocations, vol. ii, 1884, 399
treatment of fractures of the skull, vol. i, 1881–83, 83
Gunshot injuries of spine, vol. xvi, 1898, 255
wound, nephrectomies for, vol. vi, 1888, 505
wound of heart, vol. xiii, 1895, 273
wound of kidney, vol. xiv, 1896, 357
wound of stomach and liver, vol. xx, 1902, 10
wounds in civil practice, vol. xvii, 1899, 245
wounds of intestines, vol. vii, 1889, 123; vol. xi, 1893, 337
Gwyer, Dr., osteosarcoma of jaw, vol. xiii, 1895, 474

H

Habitual or recurrent dislocation of shoulder, vol. xv, 1897, 293
Halsted, W. S., brief consideration of cases of cancer of breast treated at the Johns Hopkins Hospital since 1889, vol. xix, 1901, 26
clinical and histological study of certain adenocarcinomata of breast, vol. xvi, 1898, 144, 180
consequences of hyperæmia, vol. xiii, 1895, 249
discussion on hernia, vol. xiii, 1895, 343
etiology and classification of cystitis, vol. xvi, 1898, 50
radical cure of inguinal and femoral hernia, vol. xix, 1901, 357
simple fractures of patella, vol. xvi, 1898, 103
traumatic arterio-venous aneurisms, vol. xix, 1901, 293
traumatic rupture of pancreas, vol. xvi, 1898, 232
Hammer toes, vol. xiv, 1896, 479
Hand, epithelioma of, vol. viii, 1890, 65
surgery of, vol. ii, 1884, 185
Hands, disinfection of, vol. xvii, 1899, 116
Harrington, F. B., appendicitis, vol. xvii, 1899, 103
gastric surgery, vol. xviii, 1900, 243
hernia following operations for appendicitis, vol. xvii, 1899, 190
hernia of bladder through the pelvic floor from the traction of a subperitoneal fibroma, vol. xviii, 1900, 257
Harris, M. L., a new method of pyloroplasty, vol. xx, 1902, 181
method of securing urine from either kidney by the urine segregator, vol. xvii, 1899, 306
movable kidney, its cause and treatment, vol. xix, 1901, 457
removal of bladder and prostate for carcinoma through a suprapubic opening, vol. xx, 1902, 54
supravaginal hysterectomy, vol. xx, 1902, 490
Harte, Richard H., appendicitis, vol. xvii, 1899, 108
carcinoma limited to the appendix vermiformis, discussion of its origin and its relation to appendicitis, vol. xx, 1902, 228, 259
case of severed spinal cord in which myelorrhaphy was followed by partial return of function, vol. xx, 1902, 28
effect of anæsthesia, vol. xiv, 1896, 387
epiphyseal separation of head of femur, vol. xv, 1897, 215
epiphyseal separation of lower end of femur, vol. xiii, 1895, 389
fractures and dislocations of spine, vol. xix, 1901, 335
Hartley, Dr., sarcoma of stomach, vol. xiii, 1895, 494
Hartley-Krause method, intracranial neurectomy by, vol. xiii, 1895, 500
Head, injuries of, vol. ii, 1884, 137
Healing by first intention, conditions of, vol. xvii, 1899, 116
of arteries after ligature, vol. iii, 1885, 141
Hearn, W. J., appendicitis, vol. xvii, 1899, 111
pneumotomy for abscess of lung, vol. xix, 1901, 482
removal of an œsophageal diverticulum, vol. xvii, 1899, 262

Heart, gunshot wounds of, vol. xiii, 1895, 273
puncture of, in chloroform narcosis, vol. v, 1887, 275
wounds, vol. v, 1887, 243
Hemmeter, J. C., diagnosis of cancer of stomach, vol. xviii, 1900, 138
Hemorrhage, pelvic, vol. xii, 1894, 299
Hepatic abscess, symptoms and treatment of, vol. xv, 1897, 225
Hernia, vol. vii, 1889, 25
congenital umbilical, vol. xi, 1893, 353
following operations for appendicitis, vol. xvii, 1899, 190
gangrenous, surgical treatment of, vol. vii, 1889, 191
inguinal and femoral, radical cure of, vol. xix, 1901, 337
lumbar, vol. viii, 1890, 119
of bladder met with during operations for inguinal and femoral hernia, vol. xiii, 1895, 321
of bladder through the pelvic floor from the traction of a subperitoneal fibroma, vol. xviii, 1900, 257
of Fallopian tube, vol. x, 1892, 171
of ovary, congenital, vol. xiii, 1895, 481
post-operative, prevention and cure of, vol. xix, 1901, 307
radical cure of, vol. viii, 1890, 99
strangulated, through a traumatic rupture of diaphragm, vol. xviii, 1900, 246
umbilical, operation for radical cure of, vol. xix, 1901, 296
ventral, treated by operating, vol. v, 1887, 227
Hernial apertures, implantation of silver filigree for the closure of, vol. xx, 1902, 362
Heteroplasty for defect of skull, vol. xiii, 1895, 485
Hingston, W. H., extirpation of larynx, vol. xii, 1894, 273
removal of stone in the bladder, vol. xii, 1894, 263
Hip and shoulder dislocations, vol. ii, 1884, 399
disease, subtrochanteric osteotomy for, vol. xix, 1901, 502
dislocations of, vol. xviii, 1900, 355
excision of, vol. xiii, 1895, 461, 476
joint, amputation at, vol. xiii, 1895, 494
joint, bony ankylosis of, in bad position, vol. i, 1881–83, 111
upward dislocations of, vol. x, 1892, 157
Historical sponge, an, vol. x, 1892, 245
Holt, J., address of welcome, vol. xvi, 1898, xxxiii
Homans, John, a successful case of nephrectomy for removal of a cancer of the right kidney, with some remarks upon the place of incision for this operation, vol. vii, 1889, 157
fibroid tumors of the uterus, vol. x, 1892, 79
indications for and the technique of hysterectomy, vol. xv, 1897, 27
irreducible slightly strangulated hernia of the left Fallopian tube, vol. x, 1892, 171
operative treatment of cancer in various localities, vol. xiii, 1895, 35
supravaginal hysterectomy, vol. xx, 1902, 480

Hospital clinics, vol. xiii, 1895, 461
Hour-glass stomach and its surgical treatment, vol. xviii, 1900, 165
Hubbard, J. C., studies of the blood, in its relation to surgical diagnosis, vol. xix, 1901, 104
Humerus, congenital subspinous dislocation of head of, vol. xiii, 1895, 385
fracture of, with dislocation, vol. xii, 1894, 287
fractures of, involving elbow-joint, vol. ix, 1891, 261
fractures of lower end of, vol. x, 1892, 15
Hunt, W., cystic growth within the internal condyle of the femur, vol. xi, 1893, 329
Hutchison, Joseph C., a résumé of the etiology, pathology, diagnosis, and treatment of morbus coxarius, vol. i, 1881–83, 159
Hyperæmia, consequences of, vol. xiii, 1895, 227
Hypertrophied prostate, surgery of, vol. iii, 1885, 163
Hypertrophy of prostate, vol. viii, 1890, 215
of prostate, double castration in, vol. xiii, 1895, 103
of prostate gland, vol. xiii, 1895, 173; vol. xvi, 1898, 301
of tongue, vol. v, 1887, 311
Hysterectomy, abdominal, vol. xx, 1902, 260
indications for and the technique of, vol. xv, 1897, 27
vaginal, vol. v, 1887, 323
Hysteria from a surgical standpoint, vol. xvi, 1898, 292

I

Iliac artery, ligation of the primitive, vol. i, 1881–83, 225
Immediate suture of the gall-ducts and the gall-bladder after extraction of stones, vol. xiii, 1895, 361
Imperforate rectum, vol. xvii, 1899, 270
Implantation of silver filigree for the closure of large hernial apertures, vol. xx, 1902, 362
Improved method of exploring the thoracic cavity, vol. xiv, 1896, 465
tracheotomy tube, vol. iv, 1886, 341
Indications for and the technique of hysterectomy, vol. xv, 1897, 27
Indigo calculus from the kidney, vol. xii, 1894, 265
Inflammation, local processes of, vol. i, 1881–83, 185
pathology of, vol. xiii, 1895, 227
Influence of anæsthesia on the surgery of the nineteenth century, vol. xv, 1897, 1
of operations upon the prolongation of life and permanent recovery in carcinoma of the breast, vol. i, 1881–83, 1
Inguinal and femoral hernia, operations for, vol. xiii, 1895, 321
and femoral hernia, radical cure of, vol. xix, 1901, 337
hernia, oblique, anatomy of, vol. xiii, 1895, 313
Injuries of the head, vol. ii, 1884, 137
Injury to skull, vol. xvii 1899, 230

Innominate aneurism, vol. vi, 1888, 439
artery, ligature of, vol. xiii, 1895, 291
Inoperable malignant tumors, use of animal toxins in treatment of, vol. xvi, 1898, 104
sarcoma, treatment of, with the mixed toxins of erysipelas and bacillus prodigiosus, vol. xix, 1901, 27
tumors, treatment of, vol. xii, 1894, 183
Insanity, trephining for, vol. ii, 1884, 125
Instrument, an improved, vol. xx, 1902, 496
Intermittent hydronephrosis, ureteroplasty for, vol. xv, 1897, 555
Internal carotid artery, aneurism of, vol. iv, 1886, 233
Intestinal anastomosis, vol. xvii, 1892, 309
obstruction, chronic, from incomplete volvulus of sigmoid flexure, vol. xv, 1897, 585
suture, process of repair after, vol. v, 1887, 141
suture, right-angle continuous, vol. xvii, 1899, 297
Intestine, large, surgery of, vol. xiv, 1896, 391
Intestines, gunshot wounds of, vol. vii, 1889, 123; vol. xi, 1893, 337
wounds of, vol. ii, 1884, 1
Intracanalicular growth of both breasts, vol. ix, 1891, 367
Intracapsular fracture of neck of femur, vol. i, 1881–83, 167
Intracranial neurectomy by Krause-Hartley method, vol. xiii, 1895, 500
operations for cure of facial neuralgia, vol. xiv, 1896, 1
surgery, technique of, vol. xv, 1897, 155
Intraperitoneal suprapubic cystotomy for stone, vol. xiii, 1895, 433
viscera, bullet wounds of, vol. xx, 1902, 13
Intrathoracic surgery, vol. ix, 1891, 345
tuberculosis, surgery of, vol. xiv, 1896, 129
Intra-uterine fracture, vol. ii, 1884, 425
Intubation and tracheotomy in treatment of croup, vol. vi, 1888, 443
Iodoform, anti-tubercular power of, vol. vii, 1889, 85
Irreducible dislocations of shoulder-joint, operative treatment of, vol. xv, 1897, 311
subcutaneous fractures, operative treatment of, vol. xv, 1897, 203

J

Jaw, double dislocation of, vol. xiv, 1896, 455
removal of lower, vol. xiii, 1895, 508
Jaws, closure of, vol. i, 1881–83, 469
phosphorus-necrosis of, vol. iii, 1885, 357
Johns Hopkins Hospital, cancer of breast treated at, vol. xix, 1901, 26
Johns Hopkins Medical School and Hospital, medical instruction in, vol. xix, 1901, 216
Johnston, Christopher, diagnostitial laparotomy, vol. iv, 1886, 15
Johnston, G. B., healing by first intention, vol. xvii, 1899, 147
symptoms and treatment of hepatic abscess, vol. xv, 1897, 225

Joint function, restoration of, after fracture, vol. xiii, 1895, 207, 219, 221, 223
Joints, larger, excision of, vol. vi, 1888, 15
tuberculosis of, vol. ix, 1891, 287
wounds of large, by modern military projectiles, vol. xx, 1902, 18
Jugular vein, thrombosis of, vol. xiii, 1895, 495

K

Kalteyer, F. J., blood changes induced by the administration of ether as an anæsthetic, vol. xix, 1901, 72
Kammerer, Frederick, a new method of pyloroplasty, vol. xx, 1902, 182
benign obstruction of pylorus, vol. xviii, 1900, 74
Keen, W. W., address of president, vol. xvii, 1899, 1
address on unveiling the Gross statue, vol. xv, 1897, xl
amputation of entire upper extremity and of the arm at the shoulder-joint, vol. xii, 1894, 35
bacillus communis, vol. xi, 1893, 233
bloodless operation for malignant polyp, vol. xi, 1893, 165
case of appendicitis in which the appendix became permanently soldered to the bladder, like a third ureter, producing a urinous fecal fistula, vol. xvi, 1898, 243, 252
cerebellar tumors, vol. xvi, 1898, 241
cure of facial neuralgia, vol. xiv, 1896, 41, 49
cystic pelvic tumor, vol. xviii, 1900, 354
effect of erysipelas upon sarcoma, vol. xii, 1894, 207
gastric surgery, vol. xviii, 1900, 234
gunshot injuries of spine, vol. xvi, 1898, 284
healing by first intention, vol. xvii, 1899, 151
nephrectomy for a large aneurism of the right renal artery, vol. xviii, 1900, 272
nephrorrhaphy, vol. viii, 1890, 181
pistol-shot wound of abdomen, involving the liver, stomach, superior mesenteric artery and vein, small intestine, and kidney; laparotomy; nephrectomy; death on the fifteenth day; autopsy, vol. v, 1887, 193
resection of a large part of the chest-wall for a sarcoma, vol. xix, 1901, 383
response to address of welcome, vol. xvii, 1899, xlii
Roentgen rays in surgery, vol. xv, 1897, 80
stretching of the facial nerve, vol. iv, 1886, 275
surgery of hypertrophied prostate, vol. xi, 1893, 207
surgery of the Spanish war, vol. xvii, 1899, 65
surgical treatment of aneurisms, vol. xi, 1893, 125
teaching of surgery, vol. xii, 1894, 100
technique of intracranial surgery, vol. xv, 1897, 162
three successful cases of cerebral surgery: including (1) the removal of a large intracranial fibroma; (2) exsection of damaged brain-tissue, and (3) exsection of the cerebral centre for the left hand, with remarks on the general technique of such operations, vol. vi, 1888, 293

KEEN, W. W., traumatic rupture of pancreas, vol. xvi, 1898, 232
treatment of traumatic lesions of the kidney, vol. xiv, 1896, 293, 353
KELLY, H. A., necessity of employing the newer methods of diagnosis in rectal and urinary diseases, vol. xix, 1901, 216
Kentucky, pioneer surgery of, vol. viii, 1890, 1
Kidney, cancer of right, vol. vii, 1889, 157
floating, vol. xv, 1897, 591
floating, associated with distended gall-bladder, vol. vii, 1889, 217
free division of capsule of, vol. vii, 1889, 167
gunshot wound of, vol. xiv, 1896, 357
indigo calculus from, vol. xii, 1894, 265
lacerations of, vol. xiv, 1896, 340; vol. xix, 1901, 499
movable, its cause and treatment, vol. xix, 1901, 457
sarcoma of, vol. xiii, 1895, 478, 491
surgery of, vol. xii, 1894, 111, 121
traumatic lesions of, treatment of, vol. xiv, 1896, 293, 337, 340
tuberculosis, nephrectomies for, vol. vi, 1888, 505
tuberculosis of, vol. xiv, 1896, 93
Kidneys, influence of ether upon, vol. xiii, 1895, 189
KINLOCH, R. A., pistol-shot wound of abdomen treated by laparotomy and suturing the intestines, vol. v, 1887, 183
report of a case of supposed spontaneous aneurism of the posterior tibia artery; ligature of femoral artery; incision into sac one month after, followed by serious hemorrhage; amputation through the thighs; recovery. Also a résumé of the literature of the subject, vol. i, 1881–83, 9
Knee disease, tubercular, vol. xvii, 1899, 313
tuberculosis of, vol. xiv, 1896, 715
Knee-joint, arthrectomy of, vol. viii, 1890, 257
Knock-knees, vol. xiv, 1896, 718
KOCHER, THEODORE, on some conditions of healing by first intention, with special reference to disinfection of hands, vol. xvii, 1899, 116
Kolpoplastic operation, a new, vol. v, 1887, 375
Kraske's operation and its modifications, vol. xv, 1897, 452
operation for abscess of rectum in an infant two days old, vol. xiv, 1896 461
Krause-Hartley method for intracranial neurectomy, vol. xiii, 1895, 500

L.

Laboratory methods of teaching, vol. xix, 1901, 219
Laceration of spleen and kidney, vol. xix, 1901, 499
Lacerations of kidney, vol. xiv, 1896, 340
LANE, LEVI C., fractures of the bones which form the elbow-joint, and then treatment, vol. ix, 1891, 393
hypertrophy of prostate gland, vol. xvi, 1898, 301

Lane, Levi C., successful ligation of the primitive carotid arteries, done almost simultaneously in the removal of an epithelial cancer from the base of the tongue and the fauces, vol. vii, 1889, 187
Lange, F. E., discussion on anæsthesia, vol. xiii, 1895, 204
indications for hysterectomy, vol. xv, 1897, 54
nephrectomies in cases of diseased condition of the remaining kidney, vol. xiii, 1895, 496
phlebitis following abdominal operations, vol. xix, 1901, 236
plastic operation with the view of preserving the action of the sphincter ani in cases of resection of the rectum, vol. xiii, 1895, 497
thrombosis of jugular vein, vol. xiii, 1895, 495
tuberculosis of female breast, vol. xiii, 1895, 498
Laparotomy, diagnostitial, vol. iv, 1886, 15
for peritoneal infection in typhoid fever, vol. xviii, 1900, 370
in gunshot wounds of abdomen, vol. v, 1887, 155
successful, and Kraske operation for absence of rectum in an infant two days old, vol. xiv, 1896, 461
Laplace, Ernest, intestinal anastomosis, vol. xvii, 1899, 309
Laryngectomy, total, technique of, vol. xvii, 1899, 1
Larynx, extirpation of, vol. xii, 1894, 267
foreign body impacted in, vol. x, 1892, 231
tubercular tumor of, vol. viii, 1890, 281
Lavista, R., resection of the wrist, vol. ix, 1891, 481
Lee, E. W., on opening and drainage of abscess cavities in the brain, vol. ii, 1884, 65
Leukæmic enlargement, splenectomy for, vol. xx, 1902, 210
Levis, R. J., the treatment of transverse fracture of the patella, with the object of producing bony union, vol. i, 1881–83, 99
Ligation of common femoral artery, vol. ii, 1884, 237
of primitive carotid arteries, vol. vii, 1889, 187
of primitive iliac artery, vol. i, 1881–83, 225
of spermatic cord in treatment of hypertrophy of prostate gland, vol. xiii, 1895, 173
Ligature, cicatrization in bloodvessels after, vol. ii, 1884, 249
healing of arteries after, vol. ii, 1884, 249
of common carotid artery, vol. viii, 1890, 167
of innominate artery, vol. xiii, 1895, 291
Lip, cancer of, vol. xiii, 1895, 45
carcinoma of, spontaneous disappearance of, vol. xviii, 1900, 302
Lipoma testis, vol. iv, 1886, 263
Lister's system of aseptic wound treatment, vol. i, 1881–83, 205
Lithotomy, suprapubic, vol. ii, 1884, 161
Liver, tumor of, surgical treatment of, vol. xv, 1897, 257
Local processes of inflammation, vol. i, 1881–83, 185
Localization of perinephric lesions, vol. ii, 1884, 511
Lovett, R. W., habitual or recurrent dislocation of shoulder, vol. xv, 1897, 293

Lumbar hernia, vol. viii, 1890, 119
lymphatic nodes, excision of, in malignant disease of the testicle, vol. xx, 1902, 297
Lung, abscess of, pneumotomy for, vol. xix, 1901, 482
Lupus of tongue, vol. viii, 1890, 225
Luxation of ulna in Colles' fracture, vol. i, 1881–83, 551
Lymph cyst of right side of neck, vol. x, 1892, 201
Lymphangitis with blood-poisoning, vol. xi, 1893, 299
Lymphatic system, relations of, to various regions, vol. xiii, 1895, 31

M

McArthur, L. L., gunshot wounds, vol. xx, 1902, 50
supravaginal hysterectomy, vol. xx, 1902, 491
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 447
McBurney, C., appendicitis, vol. xiii, 1895, 508
discussion on hernia, vol. xiii, 1895, 339
epithelioma of tonsil, vol xiii, 1895, 505
fracture of pelvis, vol. xiii, 1895, 503
removal of lower jaw, vol. xiii, 1895, 508
sarcoma of radius, vol. xiii, 1895, 506
suture of quadriceps tendon, vol. xiii, 1895, 507
traumatic popliteal aneurism, vol. xiii, 1895, 506
McCann, James, clinical observations on the treatment of severe railroad injuries of the extremities, vol. ii, 1884, 197
enterectomy for sarcoma of the mesentery, vol. x, 1892, 193
splenectomy for dislocated or wandering spleen, vol. v, 1887, 365
McCosh, A. J., brain abscess, vol. xiii, 1895, 482
carcinoma of cæcum simulating appendicitis, vol. xiii, 1895, 482
congenital hernia of ovary, vol. xiii, 1895, 481
myomectomy *vs.* hysterectomy, vol. xx, 1902, 458, 493
radical cure of umbilical hernia, vol. xix, 1901, 305
suture of gall-duct, vol. xiii, 1895, 481
thyroidectomy, vol. xiii, 1895, 480
McGraw, Theodore A., a contribution to the history of gunshot wounds of the intestines, vol. vii, 1889, 123
a new method of pyloroplasty, vol. xx, 1902, 184
case of splenectomy for leukæmic enlargement, vol. xx, 1902, 210
castration in hypertrophy of the prostate, vol. xiii, 1895, 170
cure of facial neuralgia, vol. xiv, 1896, 49
effect of anæsthesia, vol. xiv, 1896, 388
gastric surgery, vol. xviii, 1900, 236
gunshot wounds, vol. xx, 1902, 45, 50
influence of the Roentgen ray on sarcoma, vol. xx, 1902, 333
some observations relative to the surgery of the large intestine, vol. xiv, 1896, 391

McGraw, Theodore A., supravaginal hysterectomy, vol xx, 1902, 488
surgery of gall-bladder, vol. xi, 1893, 108
traumatic arterio-venous aneurisms, vol. xix, 1901, 294
traumatic lesions of kidney, vol. xiv, 1896, 337
treatment of cancer, vol. xiii, 1895, 97
two cases of vicious circle after gastro-enterostomy, vol. xix, 1901, 417
McGuire, Hunter, a report of twenty-one cases of suprapubic cystotomy, vol. viii, 1890, 235
address of president, vol. v, 1887, 1
operative treatment of cancer of male genitals, vol. xiii, 1895, 63
the formation of an artificial urethra in prostatic obstruction, vol. vi, 1888, 349
MacCormac, Sir William, displacement of ulnar nerve at elbow, vol. xiii, 1895, 375
Macdonald, W. G., gunshot wounds, vol. xx, 1902, 43
morcellement and bisection of the uterus in complicated abdominal hysterectomy, vol. xx, 1902, 452, 492
Maclean, Donald, the treatment of compound ganglion of the flexor tendons of the hand and foot, vol. ii, 1884, 521
Mad dogs, personal experience with, vol. xiii, 1895, 351
Malignant disease, etiology, diagnosis, and treatment of, vol. xiii, 1895, 1
disease, influence of mental depression on the development of, vol. xix, 1901, 43
diseases of stomach, vol. xviii, 1900, 97
growths, early diagnosis of, vol. vii, 1889, 9
tumors of breast, operations for removal of, vol. xix, 1901, 380
Markoe, F. H., congenital sacrococcygeal tumor, vol. xiii, 1895, 470
lateral retroperitoneal nephrectomy, vol. xiii, 1895, 472
pyloroplasty, vol. xiii, 1895, 472
splenectomy, vol. xiii, 1895, 471
Marks, S., appendicitis with complications, vol. xvii, 1899, 209
improved method of exploring thoracic cavity, vol. xiv, 1896, 477
report of forward dislocation of the fifth cervical vertebra, vol. xvii, 1899, 211
trephining the sternum for removal of a foreign body from the anterior mediastinum, with a report of a case, vol. i, 1881–83, 307
Martin, E., surgery of the Spanish war, vol. xvii, 1899, 61
Mastin, Claudius H., address of the president, vol. ix, 1891, 1
address on the unveiling of Gross statue, vol. xv, 1897, xxxiv
gunshot wound of heart, vol. xiii, 1895, 273
hernia: a comparison of the various methods adopted for its cure; inviting discussion of their respective merits, vol. vii, 1889, 1
lumbar hernia, vol. viii, 1890, 119
prostatic calculi, their probable causes, with notes of remarkable cases, vol. ii, 1884, 143
remarks of president-elect, vol. ix, 1891, xxxi
subcutaneous division of urethral stricture, vol. iv, 1886, 303

MATAS, RUDOLPH, an operation for the radical cure of aneurism based upon arteriorrhaphy, vol. xx, 1902, 396, 433
apparatus for massive infiltration anæsthesia with weak analgesic solutions, modified Schleich method, vol. xix, 1901, 412
artificial respiration by direct intralaryngeal intubation with a modified O'Dwyer tube and a new graduated air-pump in its applications to medical and surgical practice, vol. xix, 1901, 392
carcinoma limited to the appendix vermiformis, vol. xx, 1902, 258
large perineural fibroma of sciatic, vol. xvii, 1899, 281
personal experience, with remarks on the operative treatment of cancer of breast, vol. xvi, 1898, 165
primary myxosarcoma of omentum, vol. xvii, 1899, 281
surgical peculiarities of the negro, vol. xiv, 1896, 483
surgical treatment of congenital ano-rectal imperforation, vol. xv, 1897, 452
teaching of surgery, vol. xx, 1902, 113
traumatic arterio-venous aneurisms of the subclavian vessels, vol. xix, 1901, 237, 294
traumatic diaphragmatic hernia, vol. xviii, 1900, 255
treatment of aortic aneurisms, vol. xix, 1901, 374
MAYO, WILLIAM J., a new method of pyloroplasty, vol. xx, 1902, 188, 190
an operation for the radical cure of umbilical hernia, vol. xix, 1901, 296, 306
chronic ulcer of stomach, vol. xix, 1901, 213
complications following gastro-enterostomy, vol. xx, 1902, 151
malignant diseases of stomach, vol. xviii, 1900, 97
phlebitis following abdominal operations, vol. xix, 1901, 235
radical cure of aneurism, vol. xx, 1902, 431
supravaginal hysterectomy, vol. xx, 1902, 486
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 206
MEARS, J. E., abnormalities in cicatricial tissue, vol. xi, 1893, 78
address of president, vol. xii, 1894, 1
ambulatory treatment of fractures, vol. xiv, 1896, 267
bloodless operation for malignant polyp, vol. xi, 1893, 165
castration for enlarged prostate, vol. xiv, 1896, 234
closure of the jaws and its treatment, with report of a case in which complete occlusion followed a gunshot wound of the left superior maxilla received at two and one-half years of age, and which was relieved eighteen years subsequently by operation according to a new method, vol. i, 1881–83, 469
cure of facial neuralgia, vol. xiv, 1896, 42
distended gall-bladder simulating floating kidney; cholecystotomy by the lumbar incision, vol. vii, 1889, 217
irreducible shoulder dislocations, vol. xv, 1897, 443
ligation of spermatic cord in treatment of hypertrophy of prostate gland, vol. xiii, 1895, 173

Mears, J. E., nasopharyngeal or retropharyngeal growths, vol. xi, 1893, 245
phosphorus-necrosis of the jaws, vol. iii, 1885, 357
study of the pathological changes occurring in trifacial neuralgia, with the report of a case in which three inches of the inferior dental nerve were excised, vol. ii, 1884, 469
surgery of gall-bladder, vol. xi, 1893, 105
surgery of hypertrophied prostate, vol. xi, 1893, 210
teaching of surgery, vol. xii, 1894, 108
the intraperitoneal method of treating the pedicle in ovariotomy, with a report of some experiments made, vol. i, 1881–83, 173
the propriety of surgical interference in perforating typhoid ulcer, vol. vi, 1888, 419
Meckel's ganglion, operations upon, vol. xi, 1893, 235
Mediastinum, posterior, surgical technique of entry to, vol. xiii, 1895, 443
Medico-legal aspects of cranial and heart wounds, vol. v, 1887, 243
relation of the X-rays, vol. xviii, 1900, 429
Meningeal adhesions, rubber tissue for, vol. xiii, 1895, 490
Meningo-encephalocele, anterior, vol. xiii, 1895, 478
Mental depression, influence of, on the development of malignant disease, vol. xix, 1901, 43
Mesenteric glands, acute tuberculosis of, vol. xviii, 1900, 326
Mesentery, sarcoma of, vol. x, 1892, 193
Metatarsophalangeal articulations, ankylosis of, vol. xiv, 1896, 477
Methods of teaching surgery, vol. xii, 1894, 77
Meyer, Willy, a new method of pyloroplasty, vol. xx, 1902, 180
implantation of silver filigree for the closure of large hernial apertures, vol. xx, 1902, 362, 373
prostatic surgery, vol. xx, 1902, 81
splenectomy for leukæmic enlargement, vol. xx, 1902, 217
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 447
Michael, J. Edwin, report of a case of ventral hernia successfully treated by operation, with a suggestion as to the method of operating, vol. v, 1887, 227
Micrococcus tetragenus, abscess containing, vol. vi, 1888, 45
Miles, A. B., gunshot wounds of intestines, vol. xi, 1893, 337
Military field hospitals in the volunteer army, organization and equipment of, vol. xvii, 1899, 29
surgery, first-aid package in, vol. xvii, 1899, 16
Millard, P. H., clinical and medico-legal observations in certain forms of spinal injury, vol. xi, 1893, 281
Miller, De Laskie, address of welcome, vol. xvii, 1899, xxxvii
Minute of regret in memory of H. W. Brock, vol. i, 1881–83, xxvii
W. W. Greene, vol. i, 1881–83, xxvii
H. Lenox Hodge, vol. i, 1881–83, xxvii
J. T. Hodgen, vol. i, 1881–83, xxvii
J. C. Hughes, vol. i, 1881–83, xxvii
J. R. Wood, vol. i, 1881–83, xxvii

Mixter, S. J., congenital œsophageal pouch, vol. xiii, 1895, 357
cure of facial neuralgia, vol. xiv, 1895, 51
dislocations and injuries of the semilunar cartilage, vol. xi, 1893, 289
double dislocation of jaw of three months' duration, vol. xiv, 1896, 455
double renal calculus, vol. xix, 1901, 377
fractures and dislocations of spine, vol. xix, 1901, 335
gastric surgery, vol. xviii, 1900, 237
laceration of spleen and of kidney, vol. xix, 1901, 499
methods of closure of abdominal incisions, vol. xviii, 1900, 322
new method of closing the wound in thorough removal of breast, vol. xix, 1901, 380
obstruction of biliary passages, vol. xiv, 1896, 713
operative treatment of trifacial neuralgia, vol. xiv, 1896, 457
technique of intracranial surgery, vol. xv, 1897, 169
traumatic diaphragmatic hernia, vol. xviii, 1900, 255, 256
Modern hospital construction, essentials of, vol. xx, 1902, 130, 138, 142, 143, 148
Moore, E. M., annual address, vol. ii, 1884, xxi
fracture of the neck of the femur, vol. i, 1881–83, 313
remarks on retirement from office, vol. ii, 1884, xxxvi
report of cases illustrating the condition of luxation of the ulna in connection with Colles' fracture, vol. i, 1881–83, 551
section of the femur for relief of bony ankylosis of the hip-joint in bad position, with presentation of the specimen, vol. i, 1881–83, 111
Moore, James E., ambulatory treatment of fractures, vol. xiv, 1896, 267
anatomical and technical reasons why the perineal is preferable to the suprapubic route in prostatic surgery, vol. xx, 1902, 59, 84
gastric surgery, vol. xviii, 1900, 240
hysteria from a surgical standpoint, vol. xvi, 1898, 292
prevention and cure of post-operative hernia, vol. xix, 1901, 307
simple fractures of patella, vol. xvi, 1898, 101
surgical treatment of tuberculosis, vol. xiv, 1896, 184
teaching of surgery, vol. xx, 1902, 121
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 449
Morbid growths, value of early operations in, vol. i, 1881–83, 253
Morbus coxarius, vol. i, 1881–83, 159
Morcellement and bisection of the uterus in complicated abdominal hysterectomy, vol. xx, 1902, 452
Morton, T. G., cystic growth within the internal condyle of the femur, vol. xi, 1893, 329
note on a case presenting the usual symptoms of appendicitis and peritonitis in which the condition was simply retention of urine with great distention of bladder in a child, vol. xiv, 1896, 463
the pathology and treatment of club-foot, especially varus and equinovarus; with brief reports of fifteen incisions of the astragalus for correction of the deformity, vol. viii, 1890, 71

Mosher, J. M., essentials of modern hospital construction, vol. xx, 1902, 138
Mouth, floor of, cancer of, vol. xiii, 1895, 49
Movable kidney, its cause and treatment, vol. xix, 1901, 457
Mudd, H. H., ambulatory treatment of fractures, vol. xiv, 1896, 266
appendicitis, vol. xvii, 1899, 109
indications for hysterectomy, vol. xv, 1897, 49
kidney and urethral surgery, vol. xii, 1894, 171
lacerations of kidney, vol. xiv, 1896, 340
surgery of rectum, vol. xi, 1893, 153
Munro, John C., fractures and dislocations of spine, vol. xix, 1901, 333
teaching of surgery, vol. xx, 1902, 127
Murray, Dr., amputation at hip-joint, vol. xiii, 1895, 494
aneurism of circle of Willis, vol. xiii, 1895, 494
removal of tongue, vol. xiii, 1895, 494
Murray, F. W , case of acute suppurative pancreatitis, vol. xx, 1902, 219
Myomectomy *vs.* hysterectomy, vol. xx, 1902, 458
Myxosarcoma, primary, of omentum, vol. xvii, 1899, 281

N

Nancrede, Charles B., a rare form of epithelioma of the hand, vol. viii, 1890, 65
adenocarcinoma of breast, vol. xvi, 1898, 178
ambulatory treatment of fractures, vol. xiv, 1896, 268
castration for enlarged prostate, vol. xiv, 1896, 234
cystic pelvic tumor, vol. xviii, 1900, 354
discussion on hernia, vol. xiii, 1895, 345
effect of anæsthesia, vol. xiv, 1896, 388
effects of modern small-arm projectiles, as shown by the wounded of the fifth army corps during the campaign resulting in the capture of Santiago de Cuba, vol. xvii, 1899, 43
gastric surgery, vol. xviii, 1900, 239
have we any therapeutic means, as proven by experiment, which directly affect the local processes of inflammation? vol. i, 1881–83, 185
kidney and urethral surgery, vol. xii, 1894, 174
methods of closure of abdominal incisions, vol. xviii, 1900, 323
mooted points as to fractures of the arm, vol. xii, 1894, 238
results of wounds of the large joints by modern military projectiles, vol. xx, 1902, 18, 40, 52
Roentgen rays in surgery, vol. xv, 1897, 80, 88
should laparotomy be done for penetrating gunshot wounds of the abdomen involving the viscera? vol. v, 1887, 155
surgery of rectum, vol. xi, 1893, 156
surgery of the Spanish war, vol. xvii, 1899, 66, 69
surgical interference in cerebral abscess, vol. ii, 1884, 85

Nancrede Charles B., surgical treatment of cervical, thoracic, and abdominal aneurism, vol. xi, 1893, 115, 127
surgical treatment of empyema, vol. xii, 1894, 20
teaching of surgery, vol. xii, 1894, 103; vol. xx, 1902, 128
traumatic lesions of kidney, vol. xiv, 1896, 352
tuberculosis of mesenteric glands, vol. xviii, 1900, 332
very large lymph-cyst (chyle-cyst) of the right side of the neck, vol. x, 1892, 201
Nasopharyngeal growths, vol. xi, 1893, 245
Neck, lymph-cyst of right side of, vol. x, 1892, 201
Need and value of co-operative work in surgery, vol. v, 1887, 1
Negro, surgical peculiarities of, vol. xiv, 1896, 483
Neoplasms from a practical point of view, vol. ii, 1884, 501
Nephralgia, relief of, vol. vii, 1889, 167
Nephrectomies, vol. vi, 1888, 505
in cases of diseased condition of the remaining kidney, vol. xiii, 1895, 496
Nephrectomy, vol. vii, 1889, 157
for a large aneurism of the right renal artery, vol. xviii, 1900, 272
for medullary carcinoma, vol. i, 1881–83, 461
its indications and contraindications, vol. iii, 1885, 109
successful, on a patient of twenty-three months, vol. iv, 1886, 259
vs. nephrotomy, vol. xvii, 1899, 152
Nephrolithotomy, vol. iii, 1885, 125
Nephrorrhaphy, vol. viii, 1890, 181
Nerve, phrenic, vol. xiii, 1895, 265
pneumogastric, vol. xiii, 1895, 253
stretching, vol. vi, 1888, 491
Nerves, union of, vol. iv, 1886, 1
Neuralgia, facial, intracranial operations for cure of, vol. xiv, 1896, 1
trifacial, vol. i, 1881–83, 489; vol. ii, 1884, 469
trifacial, operative treatment of, vol. xiv, 1896, 457
New York Hospital, vol. xiii, 1895, 485
Non-perforating gastric ulcer, vol. xviii, 1900, 38
Norris, Basil, dislocations of the astragalus, vol. i, 1881–83, 265
extirpation of the entire tongue for cancerous affections, vol. ii, 1884, 445
personal experience with mad dogs, vol. xiii, 1895, 351
Note on a case presenting the usual symptoms of appendicitis and peritonitis in which the condition was simply retention of urine with great distention of the bladder in a child, vol. xiv, 1896, 463

O

Obituary notice of D. Hayes Agnew, vol. x, 1892, xxix
of John Light Atlee, vol. vi, 1888, xxiv
of Silas N. Benham, vol. x, 1892, xxiii
of Henry Jacob Bigelow, vol. ix, 1891, xxvii
of Albert Christian Theodor Billroth, vol. xii, 1894, xxi
of William Thompson Briggs, vol. xiii, 1895, xxiii
of William A. Byrd, vol. vi, 1888, xxvii
of Henry Fraser Campbell, vol. x, 1892, xxiv
of Francis Deane Cunningham, vol. iv, 1886, xxii
of John Staige Davis, vol. iv, 1886, xxi
of William Wirt Dawson, vol. xii, 1894, xxiv
of Louis Alexander Dugas, vol. iii, 1885, xxxiii
of Thomas Justus Dunott, vol. xii, 1894, xxv
of Arthur Edward Durham, vol. xiii, 1895, xxv
of Sir John Eric Erichsen, vol. xv, 1897, xxiii
of Samuel David Gross, vol. iii, 1885, xxxi
of Samuel Weissel Gross, vol. vii, 1889, xxi
of Moses Gunn, vol. vi, 1888, xxvii
of Sir George Murray Humphry, vol. xv, 1897, xxv
of William Hunt, vol. xv, 1897, xxvi
of Christopher Johnston, vol. x, 1892, xxiv
of Robert Alexander Kinloch, vol. x, 1892, xxvi
of Bernhardt von Langenbeck, vol. vi, 1888, xxvi
of Richard J. Levis, vol. ix, 1891, xxiv
of James Lawrence Little, vol. iii, 1885, xxxiv
of James McCann, vol. xii, 1894, xxv
of Claudius Henry Mastin, vol. xviii, 1900, 422
of J. Edwin Michael, vol. xv, 1897, xxviii
of Albert B. Miles, vol. xiii, 1895, xxiv
of Perry H. Millard, vol. xv, 1897, xxviii
of Henry Hodgen Mudd, vol. xviii, 1900, 424
of J. N. von Nussbaum, vol. ix, 1891, xxiii
of Sir James Paget, vol. xviii, 1900, 426
of William H. Pancoast, vol. xv, 1897, xxvii
of Willard Parker, vol. ii, 1884, xxxix
of Charles T. Parkes, vol. ix, 1891, xxvi
of Jules Péan, vol. xvii, 1899, xxxiii
of Washington Freeman Peck, vol. x, 1892, xxviii
of David Prince, vol. ix, 1891, xxvi
of Thomas Baird Reed, vol. ix, 1891, xxvii
of Tobias Gibson Richardson, vol. x, 1892, xxx
of Thomas Taunton Sabine, vol. vi, 1888, xxv
of James Marion Sims, vol. ii, 1884, xxxviii
of Truman Hoffman Squire, vol. ix, 1891, xxi

Obituary notice of Carl Thiersch, vol. xii, 1895, xxv
of Joseph W. Thompson, vol. iv, 1886, xxii
of Theodore Romeyn Varick, vol. vi, 1888, xxiii
of Aristide A. S. Verneuil, vol. xiii, 1895, xxvii
of Richard von Volkmann, vol. ix, 1891, xxii
of Beriah Andrew Watson, vol. xii, 1894, xxiii
of Sir Thomas Spencer Wells, vol. xv, 1897, xxi
of David Wendell Yandell, vol. xvii, 1899, xxxiv
Ochsner, A. J., a new method of pyloroplasty, vol. xx, 1902, 185
influence of the Roentgen ray on sarcoma, vol. xx, 1902, 332
prostatic surgery, vol. xx, 1902, 80
radical cure of umbilical hernia, vol. xix, 1901, 301
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 191, 208
teaching of surgery, vol. xx, 1902, 128
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 448
O'Dwyer tube, artificial respiration with a modified, vol. xix, 1901, 392
Œsophageal diverticulum, removal of, vol. xvii, 1899, 262
pouch, congenital, vol. xiii, 1895, 357
stricture, vol. xiii, 1895, 491
stricture, retrograde dilatation of, vol. xiii, 1895, 473
Œsophagus, cicatricial stricture of, vol. xix, 1901, 450
stricture of, following typhoid fever, vol. xviii, 1900, 232
strictures of, vol. i, 1881–83, 517; vol. ii, 1884, 363
Oliver, J. C., cysts in connection with the teeth, vol. xx, 1902, 383
Omentum, primary myxosarcoma of, vol. xvii, 1899, 281
Operations upon Meckel's ganglion, vol. xi, 1893, 235
Operative surgery, aseptic and antiseptic details in, vol. ix, 1891, 49
surgery of the human brain, vol. iii, 1885, 1
treatment of cancer in various localities, vol. xiii, 1895, 35, 45
Opie, E. L., pancreatitis, vol. xix, 1901, 176
Organic strictures of the urethra, vol. ii, 1884, 173
Organization and equipment of military field hospitals in the volunteer army, vol. xvii, 1899, 29
Osteomyelitis, acute, vol. xvii, 1899, 272
Osteoplastic repair of a total defect of shaft of tibia, vol. xiii, 1895, 485
Osteosarcoma of jaw, vol. xiii, 1895, 474
Osteotomy of the neck of the inferior maxilla, vol. vii, 1889, 115
Ovariotomy, treatment of pedicle in, vol. i, 1881–83, 173
Ovary, hernia of, vol. xiii, 1895, 481
Owens, John E., ambulatory treatment of fractures of lower extremity, vol. xiv, 1896, 254, 269
an emergency case, vol. viii, 1890, 231
appendicitis with complications, vol. xvii, 1899, 209
discussion on hernia, vol. xiii, 1895, 341
gunshot wounds, vol. xx, 1902, 48
irreducible shoulder dislocations, vol. xv, 1897, 449

Owens, John E., prostatic surgery, vol. xx, 1902, 78
surgical treatment of empyema, vol. xii, 1894, 25
teaching of surgery, vol. xii, 1894, 107
tubercular knee disease, vol. xvii, 1899, 313

P

Packard, J. H., anatomy of oblique inguinal hernia, vol. xiii, 1895, 313, 345
castration in hypertrophy of prostate, vol. xiii, 1895, 170
ligation of the primitive iliac artery for the relief of secondary hemorrhage after amputation at the hip-joint, vol. i, 1881–83, 225
on the operation of suprapubic cystotomy, vol. vi, 1888, 361
report of a case of innominate aneurism in which ligation of the right common carotid and subclavian arteries was performed, vol. vi, 1888, 439
report of some surgical cases, vol. i, 1881–83, 19
suprapubic cystotomy for purposes other than the extraction of calculus, vol. v, 1887, 29
Pancreas, cyst of, vol. vi, 1888, 557
surgery of, vol. iv, 1886, 99
traumatic rupture of, vol. xvi, 1898, 215
Pancreatitis, vol. xix, 1901, 149
acute suppurative, vol. xx, 1902, 219
Paranephric cysts, vol. viii, 1890, 265
Park, Roswell, a report of cases of operative attack upon Meckel's and the Gasserian ganglions, vol. xi, 1893, 235
address of president, vol. xix, 1901, 1
adenocarcinoma of breast, vol. xvi, 1898, 178, 180
an improved tracheotomy tube, vol. iv, 1886, 341
appendicitis with urinary fistula, vol. xvi, 1898, 252
castration for enlarged prostate, vol. xiv, 1896, 237
cause of cancer, vol. xix, 1901, 59
effect of anæsthesia, vol. xiv, 1896, 386
effect of erysipelas upon sarcoma, vol. xii, 1894, 208
experiments with the pyogenic bacteria, and report of a peculiar abscess containing the micrococcus tetragenus, vol. vi, 1888, 549
healing by first intention, vol. xvii, 1899, 150
improved method of exploring thoracic cavity, vol. xiv, 1896, 476
inquiry into the etiology of cancer, vol. xvi, 1898, 182
lipoma testis, or a large accumulation of fat in the tunica vaginalis, vol. iv, 1886, 263
new method of fixation of fractures, vol. xi, 1893, 31
on susceptibility and immunity, with special reference to surgical cases, vol. xiv, 1896, 271, 291
on the consequences of hyperæmia and the pathology of inflammation and suppuration, vol. xiii, 1895, 227, 252

Park, Roswell, perforating gunshot wound of stomach and liver with posterior through drainage, and recovery, vol. xx, 1902, 10, 51
primary sarcoma of tonsil, vol. xi, 1893, 241
report of an attempted bloodless operation for malignant polyp springing from the base of the skull, vol. xi, 1893, 161
results of division or resection in the neck of the pneumogastric and phrenic nerve, vol. xiii, 1895, 253
shoulder amputations, vol. xii, 1894, 74
successful nephrectomy on a patient of twenty-three months, vol. iv, 1886, 259
surgical treatment of empyema, vol. xii, 1894, 26, 28
the importance to the surgeon of familiarity with the bacillus coli communis, vol. xi, 1893, 213, 233
why should we not treat the gall-bladder as we do the appendix? vol. xx, 1902, 374
Parkes, Charles T., report of a case of cholecystotomy, vol. iii, 1885, 335
two cases of cholecystotomy, vol. iv, 1886, 297
Parkhill, C., new apparatus for fixation of bones after resection and in fractures with a tendency to displacement, vol. xv, 1897, 251
Parmenter, J., consequences of hyperæmia, vol. xiii, 1895, 251
cure of facial neuralgia, vol. xiv, 1896, 45
technique of intracranial surgery, vol. xv, 1897, 168
Parosteal sarcoma of femur, vol. xiv, 1896, 443
Past, present, and future of our Association, vol. ix, 1891, 1
Patella, fracture of, vol. xiii, 1895, 465; vol. xvi, 1898, 53; vol. xviii, 1900, 341
transverse fracture of, vol. i, 1881–83, 99
Pedicle flaps in plastic surgery, vol. xiii, 1895, 492
Pelvic and abdominal drainage, vol. vi, 1888, 561
hemorrhage, vol. xii, 1894, 299
Pelvis, fracture of, vol. xiii, 1895, 503
fractures and disjunctures of, vol. viii, 1890, 273
fractures of, vol. xix, 1901, 145
urethral fistula following fracture of, vol. x, 1892, 241
Penis, cancer of, vol. xiii, 1895, 63
Perforating gunshot wound of kidney, vol. xiv, 1896, 357
gunshot wound of stomach and liver, vol. xx, 1902, 10
typhoid ulcer, vol. vi, 1888, 419
ulcer of duodenum, vol. xviii, 1900, 1
ulcer of stomach, vol. xviii, 1900, 58
Pericarditis, purulent, following pneumonia, vol. xv, 1897, 127
suppurative, surgical treatment of, vol. xv, 1897, 101
Perineo-sacro-abdominal operations, vol. xv, 1897, 452
Perinephric lesions, localization of, vol. ii, 1884, 511
Perineural fibroma of sciatic, vol. xvii, 1899, 281
Peritonitis, tuberculous, surgical treatment of, vol. xx, 1902, 191

Peritonitis, tubercular, vol. xiv, 1896, 117
Perityphlitis and typhlitis, vol. vi, 1888, 389
Personal experience with mad dogs, vol. xiii, 1895, 351
Pharynx, cancer of, vol. xiii, 1895, 50
Phelps, C., fracture of patella, vol. xiii, 1895, 465
Phlebitis following abdominal operations, vol. xix, 1901, 223
Phosphorus-necrosis of jaws, vol. iii, 1885, 357
Phrenic nerve, vol. xiii, 1895, 265
Pilcher, L. S., ambulant treatment of fractures of lower extremity, vol. xiii, 1895, 479
ambulatory treatment of fractures of lower extremity, vol. xiv, 1896, 239, 269
anterior meningo-encephalocele, vol. xiii, 1895, 478
castration for enlarged prostate, vol. xiv, 1896, 235
castration in hypertrophy of prostate, vol. xiii, 1895, 165
surgery of rectum, vol. xi, 1893, 148
the question of the anti-tubercular power of iodoform, with a suggestion for a more exact clinical testing of the same, vol. vii, 1889, 85
venous tumors of the diploe, vol. xii, 1894, 283
Pioneer surgery of Kentucky, vol. viii, 1890, 1
Pistol-shot wound of abdomen, vol. v, 1887, 183, 193
wounds of skull, vol. ix, 1891, 433
Plastic operation with the view of preserving the action of the sphincter ani in cases of resection of the rectum, vol. xiii, 1895, 497
Pneumogastric nerve, vol. xiii, 1895, 253
Pneumotomy for abscess of lung, vol. xix, 1901, 482
Polyp, bloodless operation for malignant, vol. xi, 1893, 161
uterine, vol. xii, 1894, 293
Pons varolii, mixed sarcoma of, vol. xvii, 1899, 218
Pontico, Dr., fractures and dislocations of spine, vol. xix, 1901, 335
Popliteal aneurism, extirpation of, vol. xv, 1897, 199
Porter, C. B., a case of diffuse fibroma with a tendency to intracanalicular growth of both breasts, vol. ix, 1891, 367
atonic dilatation of stomach, vol. xv, 1897, 283
excision of a part of three ribs and a portion of diaphragm for sarcoma, vol. xix, 1901, 494
excision of varicose veins, vol. xii, 1894, 289
fracture of humerus with dislocation, vol. xii, 1894, 287
fracture of patella, vol. xviii, 1900, 341
operation for torticollis on a level with the cricoid cartilage, vol. xii, 1894, 291
purulent pericarditis following pneumonia, vol. xv, 1897, 127
shoulder amputations, vol. xii, 1894, 74
some surgical cases, vol. xii, 1894, 287
uterine polyp, vol. xii, 1894, 293
Posterior tibial artery, aneurism of, vol. i, 1881–83, 9

Post-operative hernia, prevention and cure of, vol. xix, 1901, 307
Powers, Charles A., giant sacrococcygeal tumors, vol. xix, 1901, 444
permanent suprapubic drainage for advanced tuberculosis of the bladder, vol. xx, 1902, 67
preliminary comparison of methods and results in operative surgery at the sea-level (New York) and in places of high altitude (Denver), vol. xv, 1897, 189
the question of operative interference in recent simple fractures of patella, vol. xvi, 1898, 53, 103
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 449
wound of the urinary tract during an operation for acute appendicitis, vol. xvii, 1899, 215
Pregnancy and operative surgery, vol. vi, 1888, 467
extra-uterine, vol. xii, 1894, 299
Preliminary comparison of methods and results in operative surgery at the sea-level (New York) and in places of high altitude (Denver), vol. xv, 1897, 189
Presbyterian Hospital, vol. xiii, 1895, 477
Present status of brain surgery, vol. ix, 1891, 15
status of the X-ray as a means of diagnosis and a therapeutic agent, vol. xx, 1902, 435
Prewitt, T. F., address of president, vol. xvi, 1898, 1
discussion on anæsthesia, vol. xiii, 1895, 201
gunshot injuries of spine, vol. xvi, 1898, 255, 289
kidney and urethral surgery, vol. xii, 1894, 172
surgery of gall-bladder, vol. xi, 1893, 110
surgery of hypertrophied prostate, vol. xi, 1893, 205, 210
surgery of rectum, vol. xi, 1893, 155
surgery of the Spanish war, vol. xvii, 1899, 70
surgical treatment of aneurisms, vol. xi, 1893, 126
surgical treatment of empyema, vol. xii, 1894, 22
teaching of surgery, vol. xii, 1894, 107
traumatic aneurism of internal carotid artery following gunshot injury, vol. iv, 1886, 233
traumatic rupture of pancreas, vol. xvi, 1898, 232
two cases of malignant degeneration of ulcers of the leg—one epitheliomatous, the other sarcomatous—with their bearing upon the question of the local origin of malignant growths, vol. ii, 1884, 491
Prince, David, a device for atmospheric purification, vol. iii, 1885, 387
description of a rectal obturator, and a report upon its uses, vol. i, 1881–83, 509
injuries of the head, vol. ii, 1884, 137
pelvic and abdominal drainage, vol. vi, 1888, 561
wounds, their aseptic and antiseptic management, vol. v, 1887, 349
Prostate, cancer of, vol. xiii, 1895, 72
enlarged, question of castration for, xiv, 1896, 189

Prostate gland, hypertrophy of, vol. xiii, 1895, 173; vol. xvi, 1898, 301
hypertrophied, surgery of, vol. xi, 1893, 167
hypertrophy of, vol. iii, 1885, 163; vol. viii, 1890, 215; vol. xiii, 1895, 103
Prostatic abscess, curvilinear prerectal operation for, vol. xx, 1902, 353
calculi, vol. ii, 1884, 143
obstruction, artificial urethra in, vol. vi, 1888, 349
surgery, vol. xx, 1902, 59
Puncture of heart in chloroform narcosis, vol. v, 1887, 275
Purification, atmospheric, a device for, vol. iii, 1885, 387
Purulent pericarditis following pneumonia, vol. xv, 1897, 127
peritonitis from typhoid, vol. xiii, 1895, 489
Pyloroplasty, vol. xiii, 1895, 472
new method of, vol. xx, 1902, 165
Pylorus, benign obstruction of, vol. xviii, 1900, 74
digital divulsion of, vol. vii, 1889, 97

Q

Quadriceps tendon, suture of, vol. xiii, 1895, 507
Quadruple aneurism, vol. xiii, 1895, 401
Question of castration for enlarged prostate, vol. xiv, 1896, 189
of operative interference in recent simple fractures of patella, vol. xvi, 1898, 53

R

Radical cure of aneurism, operation for, based upon arteriorrhaphy, vol. x, 1902, 396
Radius, fracture of base of, vol. x, 1892, 29
fracture of lower end of, vol. ixv, 1896, 611
sarcoma of, vol. xiii, 1895, 506
shortening of, in Colles' fracture, vol. xx, 1902, 378
Railroad injuries of the extremities, vol. ii, 1884, 197
Ransohoff, Joseph, a new method of pyloroplasty, vol. xx, 1902, 187
appendicitis, vol. xvii, 1899, 104
bloodless operation for malignant polyp, vol. xi, 1893, 165
cure of facial neuralgia, vol. xiv, 1896, 47
curvilinear prerectal operation for prostatic abscess, vol. xx, 1902, 353
gastric surgery, vol. xviii, 1900, 239
irreducible shoulder dislocations, vol. xv, 1897, 445
methods of closure of abdominal incisions, vol. xviii, 1900, 324
nephrectomy *vs.* nephrotomy, vol. xvii, 1899, 152
new method of fixation of fractures, vol. xi, 1893, 39
operative treatment of irreducible subcutaneous fractures, vol. xv, 1897, 203

Ransohoff, Joseph, parosteal sarcoma of femur, vol. xiv, 1896, 443
radical cure of aneurism, vol. xx, 1902, 431
rupture of middle meningeal artery without fracture; ligature of common carotid artery for secondary hemorrhage, vol. viii, 1890, 167
supravaginal hysterectomy, vol. xx, 1902, 490
surgical treatment of aneurisms, vol. xi, 1893, 126
susceptibility and immunity to surgical infection, vol. xiv, 1896, 285
thyroid abscess, vol. xii, 1894, 275
traumatic lesions of kidney, vol. xiv, 1896, 352
Recent Buffalo investigations regarding the nature of cancer, vol. xix, 1901, 1
Rectal and urinary diseases, diagnosis in, vol. xix, 1901, 216
cancer, vol. xiii, 1895, 77
obturator, description of, vol. i, 1881–83, 509
tumors, abdominal route in removal of, vol. xx, 1902, 474
Recto-urethral fistula following fracture of the pelvis, vol. x, 1892, 241
Rectum, absence of, Kraske operation for, vol. xiv, 1896, 461
carcinoma of, vol. xviii, 1900, 289
excision of, for cancer, vol. xiii, 1895, 487
imperforate, vol. xvii, 1899, 270
surgery of, vol. xi, 1893, 129
Relapsing appendicitis, vol. x, 1892, 179
Relation of social life to surgical disease, vol. vi, 1888, 1
Relations of the lymphatic system to the various regions, vol. xiii, 1895, 31
Remedial measures in obstruction of the common bile-duct, vol. xvi, 1898, 206
Removal of bladder and prostate for carcinoma through a suprapubic opening, vol. xx, 1902, 54
Renal calculus, double, vol. xix, 1901, 377
Report of committee of the Boston Society for Medical Improvement, vol. xviii, 1900, 370
of committee on classification of tumors, vol. xiv, 1896, 719
of Dr. S. H. Weeks, delegate to the British Medical Association, vol. xiv, 1896, 721
of the committee on necrology, vol. i, 1881–83, xxvii; vol. ii, 1884, xxxviii; vol. iii, 1885, xxxi; vol. iv, 1886, xxi; vol. vi, 1888, xxiii; vol. vii, 1889, xxi; vol. ix, 1891, xxi; vol. x, 1892, xxiii; vol. xii, 1894, xxi; vol. xiii, 1895, xxiii; vol. xv, 1897, xxi; vol. xvii, 1899, xxxiii; vol. xviii, 1900, 421
Resection of a large part of the chest wall for a sarcoma, vol. xix, 1901, 383
of the wrist; recovery; free use of the limb restored to its normal position, vol. ix, 1891, 481
Restoration of joint function after fracture, vol. xiii, 1895, 207, 219, 221, 223
Retention from displacement, bending, and valve-formation in the biliary tract, vol. xiv, 1896, 683
Retroperitoneal cyst, vol. x, 1892, 211
nephrectomy, lateral, vol. xiii, 1895, 472
tumors, vol. ix, 1891, 375

Retropharyngeal growths, vol. xi, 1893, 245
sarcoma, vol. viii, 1890, 227
Richardson, C. H., aseptic technique in the Albany Hospital, vol. xx, 1902, 143
Richardson, Maurice H., a case of retroperitoneal cyst of congenital origin in a child of thirteen months, vol. x, 1892, 211
a new method of pyloroplasty, vol. xx, 1902, 178
abnormalities in cicatricial tissue, vol. xi, 1893, 78
acute tuberculosis of mesenteric glands of the ileocæcal coil, vol. xviii, 1900, 326, 332
adenocarcinoma of breast, vol. xvi, 1898, 178
appendicitis, vol. xvii, 1899, 72, 114
appendicitis with complications, vol. xvii, 1899, 209
case of apparently hopeless infiltration of left axilla and scapula by round-celled sarcoma, vol. xvi, 1898, 309
chronic intestinal obstruction from incomplete valvulus of sigmoid flexure, vol. xv, 1897, 585
cure of facial neuralgia, vol. xiv, 1896, 49
effect of erysipelas upon sarcoma, vol. xii, 1894, 210
extra-uterine pregnancy and pelvic hemorrhage, vol. xii, 1894, 299
gastric surgery, vol. xviii, 1900, 235
gunshot injuries of spine, vol. xvi, 1898, 284
influence of the Roentgen ray on sarcoma, vol. xx, 1902, 331
intraperitoneal suprapubic cystotomy for stone, vol. xiii, 1895, 433
kidney and urethral surgery, vol. xii, 1894, 169, 178
methods of closure of abdominal incisions, vol. xviii, 1900, 308, 324
new method of fixation of fractures, vol. xi, 1893, 38
on the surgical treatment of gangrenous hernia, with a report of four cases, vol. vii, 1889, 191
perforating gunshot wound of kidney, vol. xiv, 1896, 357
Roentgen rays in surgery, vol. xv, 1897, 84
simple fractures of patella, vol. xvi, 1898, 99
splenectomy for leukæmic enlargement, vol. xx, 1902, 217
surgery of gall-bladder, vol. xi, 1893, 81, 113
surgery of hypertrophied prostate, vol. xi, 1893, 208
surgical treatment of empyema, vol. xii, 1894, 27
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 206
teaching of surgery, vol. xx, 1902, 117
the choice between the suprapubic and the infrapubic methods of reaching tumors and other surgical lesions of the pelvic organs, vol. xx, 1902, 471, 493
tumor of cæcum causing intussusception; operation on third day; reduction of invagination, enterostomy, and removal of tumor; death, vol. x, 1892, 205
ureteroplasty for intermittent hydronephrosis, vol. xv, 1897, 555
Richardson, T. G., a femoral aneurism cured by elevation and flexion of the limb, vol. v, 1887, 345

Richardson, T. G., a peculiar form of traumatic aneurism of the femoral artery, with exhibition of the specimen, vol. i, 1881–83, 453
synopsis of the treatment of a case of aneurism of the left subclavian artery, in which three methods were successfully employed; followed by death, vol. v, 1887, 341
the use of the trephine in traumatic empyema associated with thoracic fistula, vol. i, 1881–83, 241
Right-angle continuous intestinal suture, vol. xvii, 1899, 297
Rixford, Emmet, gunshot wounds, vol. xx, 1902, 48
prostatic surgery, vol. xx, 1902, 83
two cases of exophthalmic goitre treated by operation, vol. xx, 1902, 285
Roberts, John B., a clinical, pathological, and experimental study of fracture of lower end of radius with displacement of carpal fragment toward flexor or anterior surface of wrist, vol. xiv, 1896, 611
ambulatory treatment of fractures, vol. xiv, 1896, 264
anterior dislocation of tibia treated by arthrotomy, vol. xix, 1901, 441
congenital subspinous dislocation of head of humerus, vol. xiii, 1895, 385
excision of the lumbar lymphatic nodes and spermatic vein in malignant disease of the testicle, vol. xx, 1902, 297
irreducible shoulder dislocations, vol. xv, 1897, 450
restoration of joint function after fracture, vol. xiii, 1895, 221
the field and limitation of the operative surgery of the human brain, vol. iii, 1885, 1
the localization of perinephric lesions by means of clinico-anatomical study, vol. ii, 1884, 511
the surgical treatment of suppurative pericarditis, vol. xv, 1897, 101
transperitoneal uretero-lithotomy, vol. xiii, 1895, 381
treatment of fractures of the lower end of the humerus and base of the radius, vol. x, 1892, 15
Robson, A. W. M., on pancreatitis, vol. xix, 1901, 149, 182
surgical treatment of chronic ulcer of stomach, vol. xix, 1901, 184, 215
Rodman, W. L., a new method of pyloroplasty, vol. xx, 1902, 186
chronic ulcer of stomach, vol. xix, 214
gastric ulcer—non-perforating—hemorrhage, vol. xviii, 1900, 38
gunshot wounds, vol. xx, 1902, 39
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 450
Roe, W. J., pneumotomy for abscess of lung, vol. xix, 1901, 482
Roentgen ray, influence of, upon the different varieties of sarcoma, vol. xx, 1902, 308
ray skiagraphs, vol. xiv, 1896, 715
rays in surgery, vol. xv, 1897, 59
Roosevelt Hospital, vol. xiii, 1895, 495
Rubber tissue for meningeal adhesions, vol. xiii, 1895, 490
Rupture of both quadriceps extensor tendons at the patellar attachment, vol. xiii, 1895, 501

Rupture of middle meningeal artery, vol. viii, 1890, 167
Rush College, clinic at, vol. xvii, 1899, 313
Rushmore, J. D., discussion on anæsthesia, vol. xiii, 1895, 202
separation of femoral head, vol. xiii, 1895, 502
torticollis, vol. xiii, 1895, 502

S

Sacrococcygeal tumor, congenital, vol. xiii, 1895, 470
tumors, giant, vol. xix, 1901, 444
Saddle-nose celluloid bridge, vol. xiii, 1895, 487
Sanitary conditions in surgery, vol. i, 1881–83, 23
Sarcoma, influence of Roentgen ray upon the different varieties of, vol. xx, 1902, 308
inoperable, treatment of, with the mixed toxins of erysipelas and bacillus prodigiosus, vol. xix, 1901, 27
mixed, of pons varolii, vol. xvii, 1899, 218
of kidney, vol. xiii, 1895, 478, 491
of mesentery, vol. x, 1892, 193
of radius, vol. xiii, 1895, 506
of stomach, vol. xiii, 1895, 494
of tonsil, vol. vii, 1889, 57; vol. x, 1892, 173; vol. xi, 1893, 241
resection of chest wall for, vol. xix, 1901, 383
retropharyngeal, vol. viii, 1890, 227
treatment of, by electrolysis and cataphoresis combined with the internal use of Donovan's solution, vol. xv, 1897, 177
Sarcomata, multiple, vol. xiii, 1895, 475
of breast, vol. v, 1887, 233
Sayre, L. A., excision of hip, vol. xiii, 1895, 461
restoration of joint function after fracture, vol. xiii, 1895, 219
Schleich's method of infiltration anæsthesia, vol. xix, 1901, 412
Sciatic, large perineural fibroma of, vol. xvii, 1899, 281
Scrotum, cancer of, vol. xiii, 1895, 68
Seminal vesicle, removal of, vol. xviii, 1900, 334
Senn, Nicholas, a case of bony union after impacted intracapsular fracture of the neck of the femur, vol. i, 1881–83, 167
a new method of direct fixation of the fragments in compound and ununited fractures, vol. xi, 1893, 1, 35, 39
ambulatory treatment of fractures, vol. xiv, 1896, 265
an experimental and clinical study of air-embolism, vol iii, 1885, 197
appendicitis, vol. xvii, 1899, 105
etiology and classification of cystitis, vol. xvi, 1898, 6, 51
experimental researches on cicatrization in bloodvessels after ligature, vol. ii, 1884, 249
first-aid package in military surgery, vol. xvii, 1899, 16
fractures of the neck of the femur, with special reference to bony union after intracapsular fracture, vol. i, 1881–83, 333

Senn, Nicholas, healing by first intention, vol. xvii, 1899, 143
the relation of micro-organisms to injuries and surgical diseases, vol. vi, 1888, 45
the surgery of the pancreas as based upon experiments and clinical researches, vol. iv, 1886, 99
the treatment of tuberculosis of bones and joints by parenchymatous and intra-articular injections, vol. ix, 1891, 287
traumatic lesions of kidney, vol. xiv, 1896, 351, 353
tuberculosis of male genital organs, vol. xiv, 1896, 53
Severed spinal cord in which myelorrhaphy was followed by partial function, vol. xx, 1902, 28
Shattuck, F. C., atonic dilatation of stomach, vol. xv, 1897, 283
purulent pericarditis following pneumonia, vol. xv, 1897, 127
Shock, vol. vi, 1888, 533
Shortness of the radius in Colles' fracture, vol. xx, 1902, 378
Shoulder amputations, vol. xii, 1894, 35, 71
habitual or recurrent dislocation of, vol. xv, 1897, 293
Shoulder-joint, irreducible dislocations of, operative treatment of, vol. xv, 1897, 311
Skull, celluloid plate in, vol. xiii, 1895, 488
fractures of, vol. i, 1881–83, 83
heteroplasty for defect of, vol. xiii, 1895, 485
injury to, vol. xvii, 1899, 230
pistol-shot wounds of, vol. ix, 1891, 433
Silver filigree, implantation of, for the closure of large hernial apertures, vol xx, 1902, 362
wire and electricity in treatment of aortic aneurisms, vol. xix, 1901, 359
Simultaneous double aneurism of the femorals on the same side, and of the femorals and popliteal on the same side, vol. xiii, 1895, 401
Sinus pyæmia, vol. xiii, 1895, 490
Small-arm projectiles, effects of, vol. xvii, 1899, 43
Smith, H. L., penetrating pistol-shot wounds of the skull, vol. ix, 1891, 433
Smith, Stephen, on the results of treatment of simple fracture of the shaft of the femur, vol. ix, 1891, 81
on the treatment of fractures of the shaft of the femur, vol. viii, 1890, 39
Social life, relation of, to surgical disease, vol. vi, 1888, 1
Some cases not operable, vol. xvi, 1898, 306
Souchon, E., operative treatment of ankylosis of shoulder-joint, vol. xiv, 1896, 409
operative treatment of irreducible dislocations of shoulder-joint, recent or old, simple or complicated, vol. xv, 1897, 311, 450
simultaneous double aneurism of the femorals on the same side, and of the femorals and popliteal on the same side, vol. xiii, 1895, 401
Spermatic cord, ligation of, in treatment of hypertrophy of prostate gland, vol. xiii, 1895, 173

Spiller, W. G., cystic pelvic tumor appearing below Poupart's ligament and containing numerous peculiar loose bodies, vol. xviii, 1900, 345
Spina bifida and encephalocele, vol. x, 1892, 163
Spinal caries, vol. xvii, 1899, 223
injury, certain forms of, vol. xi, 1893, 281
Spine, fractures and dislocations of, vol. xix, 1901, 314
gunshot injuries of, vol. xvi, 1898, 255
surgery of, vol. ix, 1891, 133
Spleen, laceration of, vol. xix, 1901, 499
splenectomy for dislocated, vol. v, 1887, 365
Splenectomy, vol. xiii, 1895, 471
for leukæmic enlargement, vol. xx, 1902, 210
Sponge, an historical, vol. x, 1892, 245
Stenosis, cicatricial, of pylorus, vol. vii, 1889, 97
Sternberg, G. M., address on receiving the Gross statue, vol. xv, 1897, xxxviii
Sternum, trephining of, vol. i, 1881–83, 307
Stewart, Francis T., case of severed spinal cord in which myelorrhaphy was followed by partial return of function, vol. xx, 1902, 28
Stimson, Lewis A., on some modifications in the technique of abdominal surgery, limiting the use of the ligature *en masse*, vol. vii, 1889, 65
on the treatment of some old unreduced dislocations of the elbow, vol. ix, 1891, 453
the treatment of fractures of the humerus involving the elbow-joint, vol. ix, 1891, 261
upward dislocations of the hip, vol. x, 1892, 157
Stomach, adhesions about, vol. xviii, 1900, 229
and liver, perforating gunshot wound of, vol. xx, 1902, 10
atonic dilatation of, vol. xv, 1897, 283
cancer of, diagnosis of, vol. xviii, 1900, 138
chronic ulcer of, vol. xix, 1901, 184
dilatation of, surgical treatment of, vol. xviii, 1900, 124
gastro-enterostomy in chronic diseases of vol. xviii, 1900, 207
hour-glass, vol. xviii, 1900, 165
malignant diseases of, vol. xviii, 1900, 97
perforating ulcer of, vol. xviii, 1900, 58
sarcoma of, vol. xiii, 1895, 494
ulcer of, vol. x, 1892, 219
Stone in bladder, removal of, vol. xii, 1894, 239; vol. xv, 1897, 271
intraperitoneal suprapubic cystotomy for, vol. xiii, 1895, 433
Strangulated hernia through a traumatic rupture of diaphragm, vol. xviii, 1900, 246
Stretching of the facial nerve, vol. iv, 1886, 275
nerve-, vol. vi, 1888, 491
Stricture, œsophageal, vol. xiii, 1895, 491
of œsophagus, vol. xix, 1901, 450

Stricture of œsophagus following typhoid fever, vol. xviii, 1900, 232
urethral, vol. iv, 1886, 303
Strictures of œsophagus, vol. i, 1881–83, 517; vol. ii, 1884, 363
organic, of the urethra, treatment of, vol. ii, 1884, 173
Stromeyer's suggestion in treatment of congenital ano-rectal imperforation, vol. xv, 1897, 452
Studies of the blood in its relation to surgical diagnosis, vol. xix, 1901, 104
Subclavian artery, ligation of, vol. vi, 1888, 439
aneurism of left artery, vol. v, 1887, 341
Subperiosteal excision of bone, vol. xiii, 1895, 475
Subtrochanteric osteotomy for deformity following hip disease, vol. xix, 1901, 502
Superficial glands, tuberculosis of, vol. xiv, 1896, 163
Suppuration, pathology of, vol. xiii, 1895, 227
Suppurative pancreatitis, acute, vol. xx, 1902, 219
pericarditis, surgical treatment of, vol. xv, 1897, 101
Suprapubic cystostomy, vol. x, 1892, 235
cystotomy, vol. v, 1887, 9, 29; vol. viii, 1890, 235
cystotomy, operation of, vol. vi, 1888, 361
drainage for advanced tuberculosis of the bladder, vol. xx, 1902, 67
lithotomy, vol. ii, 1884, 161
Surgery, abdominal, technique of, vol. vii, 1889, 65
blood in relation to, vol. xix, 1901, 115
cerebral, vol. vi, 1888, 293
future of, vol. vii, 1889, 1
intracranial, technique of, vol. xv, 1897, 155
intrathoracic, vol. ix, 1891, 345
methods of teaching, vol. xii, 1894, 77, 89
of gall-bladder, vol. xi, 1893, 81
of hand, vol. ii, 1884, 185
of hypertrophied prostate, vol. iii, 1885, 163; vol. xi, 1893, 167
of intrathoracic tuberculosis, vol. xiv, 1896, 129
of kidney, vol. xii, 1894, 111, 121
of large intestine, some observations relative to, vol. xiv, 1896, 391
of pancreas, vol. iv, 1886, 99
of rectum, vol. xi, 1893, 129
of spine, vol. ix, 1891, 133
of tongue, vol. x, 1892, 101
of ureter, vol. xii, 1894, 129
pioneer, of Kentucky, vol. viii, 1890, 1
plastic, pedicle flaps in, vol. xiii, 1895, 492
pregnancy and operative, their mutual relations, vol. vi, 1888, 467
prostatic, vol. xx, 1902, 59
Röntgen rays in, vol. xv, 1897, 59
teaching of, vol. xx, 1902, 86, 104
tenoplastic, vol. xv, 1897, 89
value of co-operative work in, vol. v, 1887, 1

Surgical bacteria, culture of, vol. iii, 1885, 193
cases, vol. xii, 1894, 287
cases, report of some, vol. i, 1881–83, 19
crutch, vol. xiii, 1895, 483
diagnosis, blood examinations as an aid to, vol. xix, 1901, 122
disease, relation of social life to, vol. vi, 1888, 1
diseases, bacteria of, vol. iv, 1886, 53
diseases, relation of micro-organisms to, vol. vi, 1888, 45
interference in cerebral abscess, vol. ii, 1884, 85
management of typhlitis and perityphlitis, vol. vi, 1888, 389
operations and injuries, sanitary conditions in, vol. i, 1881–83, 23
peculiarities of the negro, vol. xiv, 1896, 483
technique of entry to the posterior mediastinum, vol. xiii, 1895, 443
treatment of aneurisms, vol. xi, 1893, 115
treatment of empyema, vol. xii, 1894, 11
treatment of epilepsy, vol. ii, 1884, 101
treatment of gangrenous hernia, vol. vii, 1889, 191
treatment of tuberculosis, vol. xiv, 1896, 176, 181
treatment of tumors of the bladder, vol. viii, 1890, 21
Susceptibility and immunity, with special reference to surgical cases, vol. xiv, 1896, 271, 285
Suture, intestinal, process of repair after, vol. v, 1887, 141
of gall-duct, vol. xiii, 1895, 481
of gall-ducts and gall-bladder after extraction of stones, vol. xiii, 1895, 361
Synovitis of the wrist-joint, vol. i, 1881–83, 503

T

Tarsus, excision of, vol. i, 1881–83, 285
Teaching of surgery, vol. xii, 1894, 89; vol. xx, 1902, 86, 104
Technique, aseptic operative, vol. ix, 1891, 485
of abdominal surgery, vol. vii, 1889, 65
of total laryngectomy, vol. xvii, 1899, 1
Teeth, cysts in connection with, vol. xx, 1902, 383
Temporomaxillary joint, ankylosis of, vol. vii, 1889, 115
Tendo-Achillis, suture of, vol. xiii, 1895, 500
Tenoplastic surgery, vol. xv, 1897, 89
Testicle, carcinoma of, vol. xiii, 1895, 69
malignant disease of, vol. xx, 1902, 297
Testicles, celluloid, vol. xiii, 1895, 488
Tetanus, traumatic, etiology of, vol. iii, 1885, 315
Thompson, J. F., extirpation of popliteal aneurism, vol. xv, 1897, 199
methods of closure of abdominal incisions, vol. xviii, 1900, 323
vaginal hysterectomy, vol. v, 1887, 323
Thompson, Joseph W., surgery of the hand, especially as applied in railroad injuries, vol. vii, 1884, 185

Thoracic cavity, improved method of exploring, vol. xiv, 1896, 465
Thrombosis of jugular vein, vol. xiii, 1895, 495
Thyroid abscess, vol. xii, 1894, 275
gland, enlarged accessory at base of tongue, vol. x, 1892, 213
Thyroidectomy, vol. xii, 1894, 275; vol. xiii, 1895, 480
Tibia, anterior dislocation of, treated by arthrotomy, vol. xix, 1901, 441
Tiffany, Louis McLane, a contribution to the history of ligation of the common femoral artery, vol. ii, 1884, 237
abnormalities in cicatricial tissue, vol. xi, 1893, 76
address of president, vol. xiv, 1896, 1
comparison between the surgical diseases of the white and colored races, vol. v, 1887, 261
consequences of hyperæmia, vol. xiii, 1895, 251
cure of facial neuralgia, vol. xiv, 1896, 1, 51
free division of the capsule of the kidney for the relief of nephralgia, vol. vii, 1889, 167
gastric surgery, vol. xviii, 1900, 242, 245
irreducible shoulder dislocations, vol. xv, 1897, 450
nephrolithotomy, vol. iii, 1885, 125
new method of fixation of fractures, vol. xi, 1893, 36
obstruction of biliary passages, vol. xiv, 1896, 713
pregnancy and operative surgery; their mutual relations, vol. vi, 1888, 467
strangulation of Meckel's diverticulum, vol. xii, 1894, 221
surgery of hypertrophied prostate, vol. xi, 1893, 210
surgery of kidney, vol. xii, 1894, 111, 179
surgery of rectum, vol. xi, 1893, 154
surgical infection, vol. xiv, 1896, 290
surgical treatment of empyema, vol. xii, 1894, 30
technique of intracranial surgery, vol. xv, 1897, 155
the great importance of drainage in bullet wounds of intraperitoneal viscera, vol. xx, 1902, 13, 51
traumatic lesions of kidney, vol. xiv, 1896, 351
treatment of cancer, vol. xiii, 1895, 96
Toes, hammer, vol. xiv, 1896, 478
Tongue, cancer of, vol. xiii, 1895, 46
enlarged accessory thyroid gland at base of, vol. x, 1892, 213
extirpation of entire, for cancerous affections, vol. ii, 1884, 445
hypertrophy of, vol. v, 1887, 311
lupus of, vol. viii, 1890, 225
removal of, vol. xiii, 1895, 494
surgery of, vol. x, 1892, 101
Tonsil, epithelioma of, vol. xiii, 1895, 505
sarcoma of, vol. vii, 1889, 57; vol. x, 1892, 173; vol. xi, 1893, 241
Torticollis, vol. xiii, 1895, 502
operation for, vol. xii, 1894, 291

Toxins of erysipelas and bacillus prodigiosus, treatment of inoperable sarcoma with mixed, vol. xix, 1901, 27
Tracheotomy and intubation in treatment of croup, vol. vi, 1888, 443
in croup, vol. ii, 1884, 381
tube, improved, vol. iv, 1886, 341
Transperitoneal uretero-lithotomy, vol. xiii, 1895, 381
Traumatic aneurism of the femoral artery, vol. i, 1881–83, 453
arterio-venous aneurisms of the subclavian vessels, vol. xix, 1901, 237
cephalhydrocele, vol. ii, 1884, 55
diaphragmatic hernia, vol. xviii, 1900, 246
lesions of kidney, treatment of, vol. xiv, 1896, 293, 337, 340
popliteal aneurism, vol. xiii, 1895, 506
rupture of pancreas, vol. xvi, 1898, 215
tetanus, etiology of, vol. iii, 1885, 315
Tremaine, William S., cyst of the pancreas successfully removed, vol. vi, 1888, 557
suprapubic lithotomy with the report of a successful case, vol. ii, 1884, 161
Trephine, use of, in traumatic empyema, vol. i, 1881–83, 241
Trephining for insanity consequent upon a depressed fracture of the skull, vol. ii, 1884, 125
of the sternum, vol. i, 1881–83, 307
Trifacial neuralgia, vol. i, 1881–83, 489; vol. ii, 1884, 469
neuralgia, operative treatment of, vol. xiv, 1896, 457
Triple aneurism, vol. xiii, 1895, 401
Tubercular knee disease, vol. xvii, 1899, 313
mesenteric glands, successful removal of acutely inflamed, vol. xviii, 1900, 264
peritonitis, vol. xiv, 1896, 117
tumor of larynx, removal of, vol. viii, 1890, 281
Tuberculosis, acute, of mesenteric glands of the ileocæcal coil, vol. xviii, 1900, 326
intrathoracic, surgery of, vol. xiv, 1896, 129
of bladder, suprapubic drainage for, vol. xx, 1902, 67
of bones and joints, vol. ix, 1891, 287
of female breast, vol. xiii, 1895, 498
of female genital organs, vol. xiv, 1896, 93
of kidney, vol. xiv, 1896, 93
of knee, vol. xiv, 1896, 715
of male genital organs, vol. xiv, 1896, 53
of superficial glands, vol. xiv, 1896, 163
surgical treatment of, vol. xiv, 1896, 176, 181
Tuberculous kidney, nephrectomies for, vol. vi, 1888, 505
peritonitis, surgical treatment of, vol. xx, 1902, 191
Tumor, cerebral, vol. x, 1892, 183
cystic pelvic, vol. xviii, 1900, 345

Tumor of bladder, vol. viii, 1890, 21
of cæcum causing intussusception, vol. x, 1892, 205
of liver, surgical treatment of, vol. xv, 1897, 257
Tumors, cerebellar, cranial cracked-pot sound as a symptom of, vol. xvi, 1898, 234
classification of, report of committee on, vol. xiv, 1896, 719
giant sacrococcygeal, vol. xix, 1901, 444
rectal, abdominal route in removal of, vol. xx, 1902, 474
retroperitoneal, vol. ix, 1891, 375
treatment of inoperable, vol. xii, 1894, 183
Turner, Dr., phlebitis following abdominal operations, vol. xix, 1901, 235
Typhlitis and perityphlitis, vol. vi, 1888, 389
Typhoid fever, laparotomy for peritoneal infection in, vol. xviii, 1900, 370
ulcer, perforating, surgical treatment of, vol. vi, 1888, 419

U

Ulcer of stomach, vol. x, 1892, 219
of stomach, chronic, vol. xix, 1901, 184
typhoid, vol. vi, 1888, 419
Ulcers of leg, malignant degeneration of, vol. ii, 1884, 491
Ulnar nerve, dislocation of, vol. xiii, 1895, 281
nerve displacement of, at elbow, vol. xiii, 1895, 375
Umbilical hernia, congenital, vol. xi, 1893, 353
hernia, operation for radical cure of, vol. xix, 1901, 296
Union following pathological fracture of femur due to secondary carcinoma, vol. xviii, 1900, 299
of nerves of different function considered in its pathological and surgical relations, vol. iv, 1886, 1
Uretero-lithotomy, transperitoneal, vol. xiii, 1895, 381
Ureteroplasty for intermittent hydronephrosis, vol. xv, 1897, 555
Ureter, surgery of, vol. xii, 1894, 129
Ureters, catheterization of, in the male, vol. xix, 1901, 218
Urethra, artificial, in prostatic obstruction, vol. vi, 1888, 349
organic strictures of, vol. ii, 1884, 173
Urethral stricture, vol. iv, 1886, 303
vegetations, treatment of, vol. xii, 1894, 295
Urethritis, anterior, vol. viii, 1890, 245
Urethrotome, vol. xiii, 1895, 468
Urethrotomy, external median perineal, vol. i, 1881–83, 253
Urinary tract, wound of, during an operation for acute appendicitis, vol. xvii, 1899, 215
Urine, method of securing, from either kidney by the urine segregator, vol. xvii, 1899, 306
segregator, use of, vol. xvii, 1899, 306

Uterus and vagina, complete absence of, vol. xviii, 1900, 339
carcinoma of, early signs of, vol. xix, 1901, 24
fibroid tumors of, vol. x, 1892, 79
morcellement and bisection of, in complicated abdominal hysterectomy, vol. xx, 1902, 452
Uterine polyp, vol. xii, 1894, 293

V

Vagina, atresia or defect of, vol. v, 1887, 375
Vaginal hysterectomy, vol. v, 1887, 323
Value of early operations in morbid growths, vol. i, 1881–83, 253
Vander Veer, Albert, a new method of pyloroplasty, vol. xx, 1902, 182
discussion on hernia, vol. xiii, 1895, 345
gunshot wounds, vol. xx, 1902, 46, 51
indications for hysterectomy, vol. xv, 1897, 43
phlebitis following abdominal operations, vol. xix, 1901, 223, 235
removal of Meckel's ganglion for the relief of trifacial neuralgia, with a report of a case, vol. i, 1881–83, 253
retroperitoneal tumors; their anatomical relations, pathology, diagnosis, and treatment, with report of cases, vol. ix, 1891, 375
some unusual cases of appendicitis, vol. xvii, 1899, 199
supravaginal hysterectomy, vol. xx, 1902, 484
surgery of the Spanish war, vol. xvii, 1899, 62
the essentials of modern hospital construction, vol. xx, 1902, 130
the X-ray in diagnosis and therapeutics, vol. xx, 1902, 447
to what extent can we classify vesical calculi for operation? vol. v, 1887, 79
tuberculosis of female genital organs, including tuberculosis of kidney, vol. xiv, 1896, 93
Varicose veins, vol. xiii, 1895, 467
veins, excision of, vol. xii, 1894, 289
Vegetations, urethral, vol. xii, 1894, 295
Venous tumor of the diploe, vol. xii, 1894, 283
Ventral hernia treated by operation, vol. v, 1887, 227
Vesical calculi, classification of, vol. v, 1887, 79
Vesicle, seminal, removal of, vol. xviii, 1900, 334
Vicious circle after gastro-enterostomy, vol. xix, 1901, 417
Vose, R. H., forcible correction, vol. xvii, 1899, 223

W

Walker, E. W., floating kidney containing three dermoid cysts and several serous cysts, vol. xv, 1897, 591
strangulated hernia through a traumatic rupture of diaphragm, vol. xviii, 1900, 246
Warren, J. Collins, a case of enlarged accessory thyroid gland at the base of the tongue, vol. x, 1892, 213
a study of twenty-four cases of laparotomy for peritoneal infection in typhoid fever, vol. xviii, 1900, 570
address of president, vol. xv, 1897, 1
congenital umbilical hernia, vol. xi, 1893, 353
discussion on hernia, vol. xiii, 1895, 344
effect of erysipelas upon sarcoma, vol. xii, 1894, 208, 211
hernia of bladder, vol. xviii, 1900, 263
hypertrophies and degenerations of cicatrices and cicatricial tissue, vol. xi, 1893, 41, 78,
new method of fixation in fractures, vol. xi, 1893, 38
radical cure of inguinal and femoral hernia, vol. xix, 1901, 356
radical cure of umbilical hernia, vol. xix, 1901, 306
teaching of surgery, vol. xii, 1894, 96, 98
the early diagnosis of malignant growths, vol. vii, 1889, 9
the healing of arteries after ligature, vol. iii, 1885, 141
the process of repair after resection of the intestine and intestinal suture, vol. v, 1887, 141
thorough removal of breast, vol. xix, 1901, 382
treatment of cancer, vol. xiii, 1895, 100
Watson, B. A., an experimental study of anæsthetics, vol. ii, 1884, 19
an experimental study of the effects of puncture of the heart in cases of chloroform narcosis, vol. v, 1887, 275
Lister's system of aseptic wound treatment *vs.* its modifications, vol. i, 1881–83, 205
Watson, F. S., hour-glass stomach and its surgical treatment, vol. xviii, 1900, 165
prostatic surgery, vol. xx, 1902, 72
Weeks, S. H., an improved instrument, vol. xx, 1902, 496
appendicitis, vol. xvii, 1899, 103
cholecystectomy, vol. xiii, 1895, 347
cure of facial neuralgia, vol. xiv, 1896, 46
drainage and drainage-tubes in their application to the treatment of wounds, vol. vii, 1889, 73
fractures and dislocations of spine, vol. xix, 1901, 314, 336
gastric surgery, vol. xviii, 1900, 241
gunshot wounds, vol. xx, 1902, 46
kidney and urethral surgery, vol. xii, 1894, 176
mixed sarcoma of pons varolii, vol. xvii, 1899, 218

Weeks, S. H., nephrectomy *vs.* nephrotomy, vol. xvii, 1899, 185
relapsing appendicitis operated on during the interval of attacks, vol. x, 1892, 179
removal of the Gasserian ganglion, vol. xv, 1897, 171
report of, as delegate to the British Medical Association, vol. xiv, 1896, 721
sarcoma of the tonsil, vol. x, 1892, 173
supravaginal hysterectomy, vol. xx, 1902, 486
surgery of gall-bladder, vol. xi, 1893, 112
surgical treatment of empyema, vol. xii, 1894, 29
Weir, Robert F., a new method of pyloroplasty, vol. xx, 1902, 183, 188
address of president, vol. xviii, 1900, 1
carcinoma limited to the appendix vermiformis, vol. xx, 1902, 258
celluloid plate in skull, vol. xiii, 1895, 488
celluloid testicles, vol. xiii, 1895, 488
gastric surgery, vol. xviii, 1900, 243
gastrorrhaphy for diminishing a dilated stomach, vol. x, 1892, 149
influence of ether upon kidneys, vol. xiii, 1895, 189
methods of closure of abdominal incisions, vol. xviii, 1900, 318
operation for dislocation of elbow, vol. xiii, 1895, 489
prostatic surgery, vol. xx, 1902, 79
saddle-nose celluloid bridge, vol. xiii, 1895, 487
surgical treatment of surgical kidney, vol. xii, 1894, 121
surgical treatment of tuberculous peritonitis, vol. xx, 1902, 207
teaching of surgery, vol. xii, 1894, 106; vol. xx, 1902, 124
technique of intracranial surgery, vol. xv, 1897, 166
Weist, J. R., foreign bodies in the air-passages; a study of 1000 cases to determine the propriety of bronchotomy in such accidents, vol. i, 1881–83, 117
Röntgen rays in surgery, vol. xv, 1897, 88
Welch, W. H., laboratory methods of teaching, vol. xix, 1901, 219
Wharton, H. R., a case of foreign body impacted in the larynx: tracheotomy; removal of a piece of bone through tracheotomy wound after six months, vol. x, 1892, 231
cicatricial stricture of œsophagus, vol. xix, 1901, 450
discussion on anæsthesia, vol. xiii, 1895, 201
dislocation of ulnar nerve at elbow, vol. xiii, 1895, 281
multiple coccygeal angiofibromata, vol. xviii, 1900, 305
White and colored races, comparison of diseases in, vol. v, 1887, 261
White, J. William, a method of applying antisepsis in the treatment of recent anterior urethritis, vol. viii, 1890, 245
report of committee of the American Surgical Association on the medico-legal relations of the X-rays, vol. xviii, 1900, 429
results of double castration in hypertrophy of prostate, vol. xiii, 1895, 103
Röntgen rays in surgery, vol. xv, 1897, 59

White, J. William, the present position of the surgery of the hypertrophied prostate, vol. xi, 1893, 167, 209, 210
the surgery of the spine, vol. ix, 1891, 133
Why should we not treat the gall-bladder as we do the appendix? vol. xx, 1902, 374
Wight, J. S., bacilli coli communis, vol. xi, 1893, 233
dislocations of the carpus, vol. ix, 1891, 465
mooted points as to fracture of the arm, vol. xii, 1894, 237
strangulation of Meckel's diverticulum, vol. xii, 1894, 221
surgery of hypertrophied prostate, vol. xi, 1893, 208
ten cases of ankylosis of the elbow-joint after treatment of fracture of the lower end of the humerus, with the forearm in the extended position, vol. xi, 1893, 271
treatment of cancer, vol. xiii, 1895, 95
treatment of cancer of breast, vol. xiii, 1895, 51
Willard, De Forest, address of president, vol. xx, 1902, 1
ambulatory treatment of fractures, vol. xiv, 1896, 266
cholecystectomy for impacted gall-stones, vol. xi, 1893, 363
cerebellar tumors, vol. xvi, 1898, 241
cystic pelvic tumor appearing below Poupart's ligament and containing numerous peculiar loose bodies, vol. xviii, 1900, 345, 354
effect of anæsthesia, vol. xiv, 1896, 387
erysipelas: has the streptococcus erysipelatosus an antagonistic and curative effect upon local tuberculosis? vol. xii, 1894, 213
fracture of femur, vol. xviii, 1900, 304
healing by first intention, vol. xvii, 1899, 151
improved method of exploring thoracic cavity, vol. xiv, 1896, 476
intrathoracic surgery: bronchotomy through the chest wall for foreign bodies impacted in the bronchi, vol. ix, 1891, 345
nephrectomies for gunshot wound and for tuberculous kidney, vol. vi, 1888, 505
new method of fixation of fractures, vol. xi, 1893, 34
radical cure of umbilical hernia, vol. xix, 1901, 304
Röntgen ray skiagraphs, vol. xiv, 1896, 715
Röntgen rays in surgery, vol. xv, 1897, 88
surgical treatment of empyema, vol. xii, 1894, 24
tenoplastic surgery, vol. xv, 1897, 100
the D. Hayes Agnew Memorial Wing of the University Hospital, Philadelphia, vol. xvi, 1898, xxxi
traumatic lesions of kidney, vol. xiv, 1896, 350
treatment of aortic aneurisms, vol. xix, 1901, 374
tuberculosis of superficial glands, vol. xiv, 1896, 163
Williams, F. H., Röntgen rays in surgery, vol. xv, 1897, 85
Willis, circle of, aneurism of, vol. xiii, 1895, 494
Willson, Robert N., carcinoma limited to the appendix vermiformis, discussion of its origin and its relation to appendicitis, vol. xx, 1902, 228

Woolsey, Dr., retrograde dilatation of œsophageal stricture, vol. xiii, 1895, 473
Wound of the urinary tract during an operation for acute appendicitis, vol. xvii, 1899, 215
Wounds, antiseptic treatment of, vol. i, 1881–83, 137
aseptic and antiseptic management of, vol. v, 1887, 349
drainage in treatment of, vol. vii, 1889, 73
of intestines, vol. ii, 1884, 1
of the large joints, results of, by modern military projectiles, vol. xx, 1902, 18
Wright, J. H., atonic dilatation of stomach, vol. xv, 1897, 283
Wrist, resection of, vol. ix, 1891, 481
Wrist-joint, synovitis of, vol. i, 1881–83, 503

X

X-ray as a means of diagnosis and a therapeutic agent, vol. xx, 1902, 435
X-rays, medico-legal relations of, vol. xviii, 1900, 429

Y

Yandell, David W., address of president, vol. viii, 1890, 1
address to president in reply, vol. i, 1881–83, xxv
closing remarks of president, vol. ix, 1891, xxix
Young, H. H., catheterization of ureters in the male, vol. xix, 1901, 218

RD
1
A48
v.20
Biological
& Medical
Serials

American Surgical Association
Transactions

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

STORAGE